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VEHICLE MAINTENANCE CONTROL AND ANALYSIS SPECIALIST

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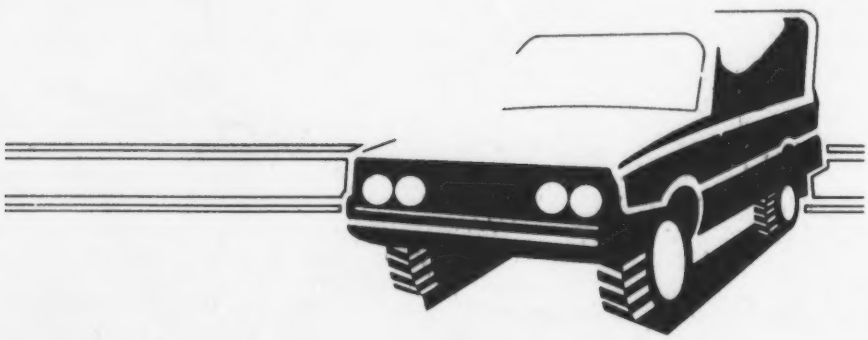
Volume 2

Maintenance Data Collection and Analysis



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Preface

NOW THAT you have completed Volume 1 of this CDC, you should be thoroughly familiar with the functions of vehicle maintenance management.

In this volume we discuss the maintenance data collection system and analysis, dividing our discussion into six chapters: Electronic Data Processing, Data Collection System, Data Inquiry System, Standards Analysis, Visual Media, and Written Presentations.

A glossary of acronyms and abbreviations used in this course is included at the end of this volume.

Code numbers appearing on figures are for preparing agency identification only.

This volume is valued at 12 hours (4 points). Material in this volume is technically accurate, adequate, and current as of July 1985.

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CHAPTER 1

Electronic Data Processing

VEHICLE MAINTENANCE has come to depend upon fast and efficient service provided by mechanized systems. The system used in vehicle maintenance is known as the Vehicle Integrated Management System (VIMS).

This chapter deals exclusively with electronic data processing equipment (EDPE) and the important source documents used to provide that fast and efficient service the Air Force depends on.

1-1. Computer Operation

While you will not be involved directly with the actual operation of the computer which produces your maintenance data, you should have some insight of the complex system that is required to support the VIMS.

200. State the prime function of Data Automation in connection with maintenance data processing, how data automated systems aid you, and under what function Data Automation operates.

Data Automation. The volume of statistical data to be processed has increased much faster than the number of trained people needed to process it. Much of the work involved in the hand-processing of data is repetitive and monotonous. It is doubtful whether the massive increase in data could have been handled efficiently had not computers and high-speed data processing machines been developed. Much of the monotony has been taken out of data processing by machines. A machine can be programmed to perform any number of operations in exactly the same way every time, for as long as desired, and without fatigue or boredom.

In a sense, the Air Force has grown up with computers and electronic data processing. The development of electronic computers and electronic data processing machines began to accelerate in the forties, the same decade in which the Air Force became a separate service. Now, we are paid by computer, and in some cases, we receive our assignments from a computer. Supply functions are almost completely automated, as are maintenance data collecting and labor-hour accounting. This is all to the good, since it relieves us from much of the drudgery in sorting, filing, and keeping tables on vast amounts of data.

Data Automation, a function under the Comptroller, is responsible for processing the maintenance data generated under the provisions of AFM 77–310, Vol. 3, *Vehicle Integrated Management System (VIMS)*.

Data Automation may be thought of as the bookkeeper and accountant of the maintenance activity. Since you are a member of the management team, you should be familiar with the operation of your accountant. You can surely realize the total effort will be more efficient if you understand the what, where, why, and when of the data automation support.

Exercises (200):

1. How do automated data systems aid you in your job?

2. What is the prime function of Data Automation in maintenance data processing?

3. Under what function does Data Automation operate?

201. Given a properly completed AF Form 1530, mark a blank punch card in the appropriate places indicated by that form and state the use of punch cards in a computerized system.

The computer is an automatic, electronic device that, in general, manipulates data at high speed. It cannot perform its function, however, without some data on which to operate. Nor can it function without instructions that tell it what to do with the data. One of the most common methods of inputting data and instructions into the computer system is by the punch card. Often, in turn, the information punched on a card comes from data that has been entered on a Punch Card Transcript (AF Form 1530). Such a punch card is shown in figure 1-1. Study this figure carefully as you read the following text material.

Punch Card Transcript. The AF Form 1530 consists of 80 columns and a number of rows. Each row, when filled in, represents the data that should be on a punch card when it is completed. The AF Form 1530 is filled in by placing the character to be punched into the punch card under the corresponding column number on the AF Form 1530, as shown on figure 1-2.

Punch Card. A punch card is used for communication with EDPE. Information is recorded on punch cards in the

form of small holes in specific locations. These are shown in figure 1-1. Information represented on cards similar to the one shown in figure 1-1 can be read, or sensed, as the cards are moved through a card-reading machine.

When we say that a card-reading machine "reads" or "senses" the information punched in a card, we mean that the machine automatically converts the punched coded information on the card to an electronic language and enters the data into the data processing machine. Cards are used both for entering data *into* and extracting data *from* a data processing machine. Therefore, cards may be used not only as a means of transferring data from some original source to a data processing machine but also as a common medium for the exchange of information between data processing machines.

Cards contain vertical columns with punching positions found in each column. The punching positions form horizontal rows across the card. One or more punches in a single column represent a character. The number of columns used depends on the amount of data to be represented.

The punch card is sometimes called a unit record, because the data is confined to the maximum number of columns on the card. Data is read or punched as a *unit of information*. A portion of a record, complete record, or more than one record may be represented on one card. If more than the maximum number of columns on the card are needed to contain the data of a record, two or more cards may be used. Continuity between the cards of one record may be established by information punched in designated columns of each card.

The punch card has 12 possible punching positions in each vertical column, as shown in figure 1-1. A vertical column on this card may represent a *numeric*, an *alphabetic*, or a *special* character. The 12 vertical punching positions are divided into two areas: *numeric* and *zone*. The first nine punching positions, starting at the bottom of the card, are the numeric punching positions and have the numeric values indicated on the card. The positions marked 11 and 12 are the zone positions. The 0 position is considered both a numeric and a zone position.

A *numeric* character is recorded on this card by a single punch in a vertical column in the position which represents the digit. For example, a four is represented by a single punch in the four numeric position of the column.

An *alphabetic* character is represented by two punches in a vertical column: one numeric punch and one zone punch. The alphabetic characters A through I use the 12 zone punch and a numeric punch 1 through 9, respectively. The alphabetic characters J through R use the 11 zone punch and a numeric punch 1 through 9, respectively. The alphabetic characters S through Z use the 0 zone punch and a numeric punch 2 through 9, respectively.

A *special* character may be represented by one, two, or three punches in a vertical column on a card. Special characters are represented by punch configurations not used to represent numeric or alphabetic characters.

Exercises (201):

1. Of what use are punch cards to a computerized system?

2. Use the information on the AF Form 1530 in figure 1-2 to darken the appropriate places on the blank punch card, figure 1-3.

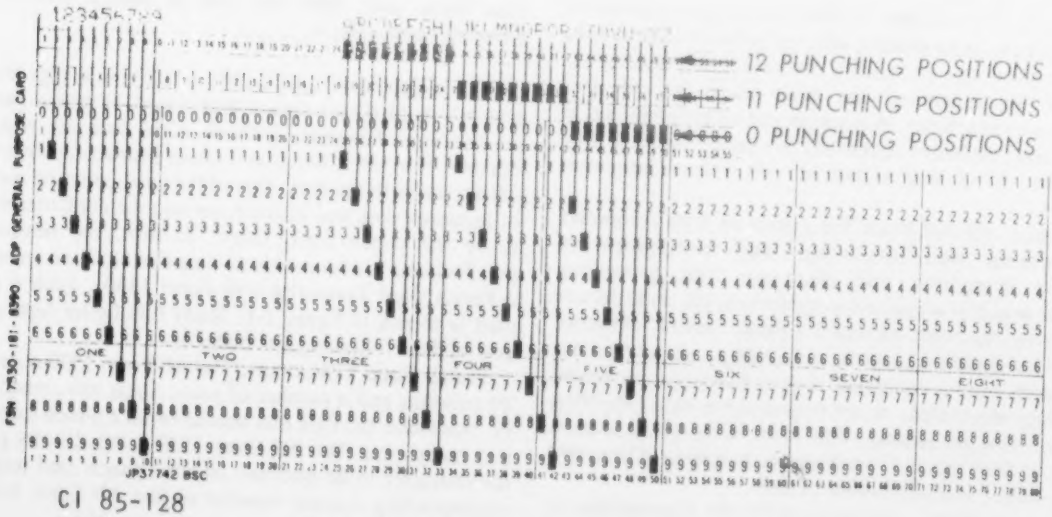

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Figure 1–1. Punch card illustrating punch positions.

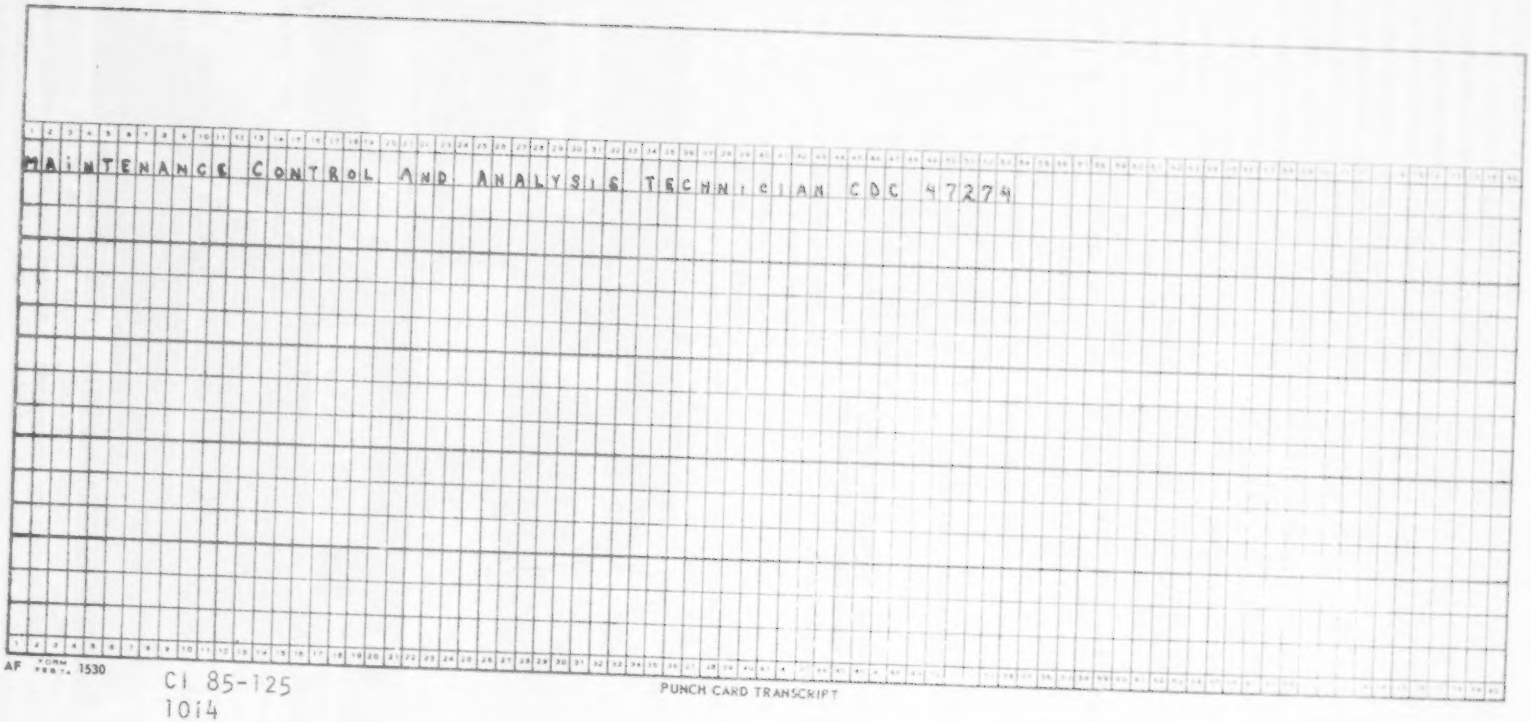

Figure 1–2. Sample of AF Form 1530.

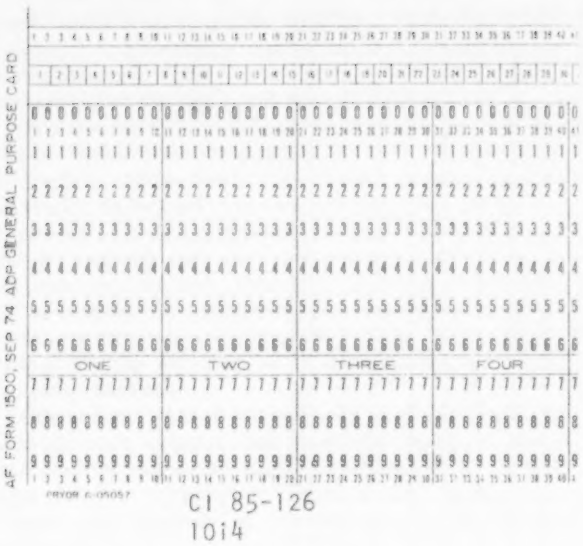

Figure 1-3. Blank punch card (objective 201, exercise 2).

202. Identify the main parts of the keypunch machine and the process that occurs when data is transferred from a source document to a punch card.

Keypunch. In the previous section, you used a pencil to blacken the appropriate places on a punch card to indicate specific characters, as designated on the AF Form 1530. In actuality, of course, the places you darkened would have been punched into the card by a card punch (keypunch) machine (fig. 1-4). Note the card hopper, read station, stacker, and keyboard in figure 1-4; these are four of the five main parts of the keypunch machine shown. The fifth part, the punch station, is identified in this figure by PUN and ON. The card machine is one of the many punch card accounting machines (PCAM) that complement a computerized system. However, you are more likely to come into contact with this particular machine than with any other PCAM. Although it is not normally considered your job to use this machine, circumstances may at some time require you to do so. For this reason, and in order for you to better understand what happens to the raw data before it enters the computer, you need some understanding of the workings of the card punch machine.

The process that occurs when data are to be transferred from a maintenance form to a punch card consists of several steps:

a. The forms to be keypunched are checked for accuracy.

b. The maintenance forms are then sorted into stacks, so that the types of work (work orders, time cards, gas cards, etc.) are in batches. This is done so that the appropriate program card (drum card) used in the keypunch machine can be used to facilitate the punching of duplicated entries. The *drum card* is designed to allow for the type of characters to be punched in a field (alpha, numeric).

c. Next, the actual keypunching takes place. The keypunch operator transcribes the needed information *from* the source document *to* the punch card. To do this, the card enters the machine from the card hopper and passes to the punching station. This is where the holes are punched into the card by pressing the appropriate keys on the keyboard of the machine. After the holes are punched, the card goes to the reading station. As the card passes through the reading station, the punches on that card can be duplicated on the new card at the punching station. From the reading station, the card goes to the card stacker.

d. The last step in processing the maintenance data, as far as the card punch is concerned, is verification of the data. This is done either by a verifying machine, which is similar to a card punch machine, or through visual inspection of the cards on a sampling basis. Most keypunch operators are so accurate that visual spot checking of the punch cards is sufficient for checking keypunch accuracy. Many of the keypunch errors are located by the *error edit* programs in the computer itself.

Special emphasis is made here on the differences in keypunch machines. At present, several keypunch machines are being used by the Air Force. When different models of these machines are made, they may have different character sets. This is especially true in reference to the special characters. You should become familiar with the punches that make special characters on the card punch available to you. Since most computers used by the Air Force for maintenance are made by Burroughs and most keypunch machines are made by IBM, it would be beneficial for you to know the differences between what the Burroughs computer reads and what the IBM keypunch punches.

Exercises (202):

1. Name the five main parts of the keypunch machine.

2. Give a very brief description of the process that occurs when transferring data from a source document to a punch card.

203. Identify the major components of a computer system and state the primary function of each component.

Computer Components. Electronic data processing equipment consists of five major components, each with a separate function: (1) the input component, which provides a means for entering original data into the machine; (2) the control component, which determines the type, sequence, and direction of the computations; (3) the memory or storage component, which retains information until it is needed; (4) the arithmetic and logic component, which does the simple counting; and (5) the output component, which provides the means of discerning final results. Now let's examine each component at little closer.

Input components. The source data, or that information which is to be processed by the computer system, is introduced through any of several input components. These components are magnetic tape readers, punched paper tape readers, punch card readers, communication lines, or even the output of other computers. Input components read or sense code data that are recorded on a prescribed medium and make this information available to the computer.

Control component. The control component is like a master dispatching station on a railroad. It sets switches and directs the flow of data through the electronic data processing system (EDPS). The sequence of steps to be performed must be translated into detailed instructions which can be understood by the system. A series of instructions is called a *program*. Since it is retained in the internal storage component, it is called a *stored program*. These coded instructions in internal storage are made available to the control component as needed to direct and complete an entire sequence of operations.

Memory component. The memory or storage component is the nerve center of the EDPE. All information entering the computer or generated within the computer must be stored or must pass through the memory component. The information memorized by this component is readily accessible, can be referred to once or many times, and can be replaced whenever desired.

Arithmetic and logic component. The arithmetic and logic component can add, subtract, multiply, divide, and compare numbers in a manner similar to an office calculator, but at lightning speed. It is here that the actual work of problem-solving is done. In addition to the arithmetic operations already mentioned, this component can shift numbers right and left and can assist in certain operations which make it possible for the EDPE to make logic decisions. It can distinguish negative, positive, and zero values and transfer this information to other components of the system.

Output components. Output components provide the means to discern final results. Card punches, paper tape machines, magnetic tape readers-writers, printers, and display components record or write information from the computer. Output information can be punched on cards, recorded on paper tape or magnetic tape, or printed out at tremendous speeds.

Exercises (203):

1. Name the five major components of a computer system.

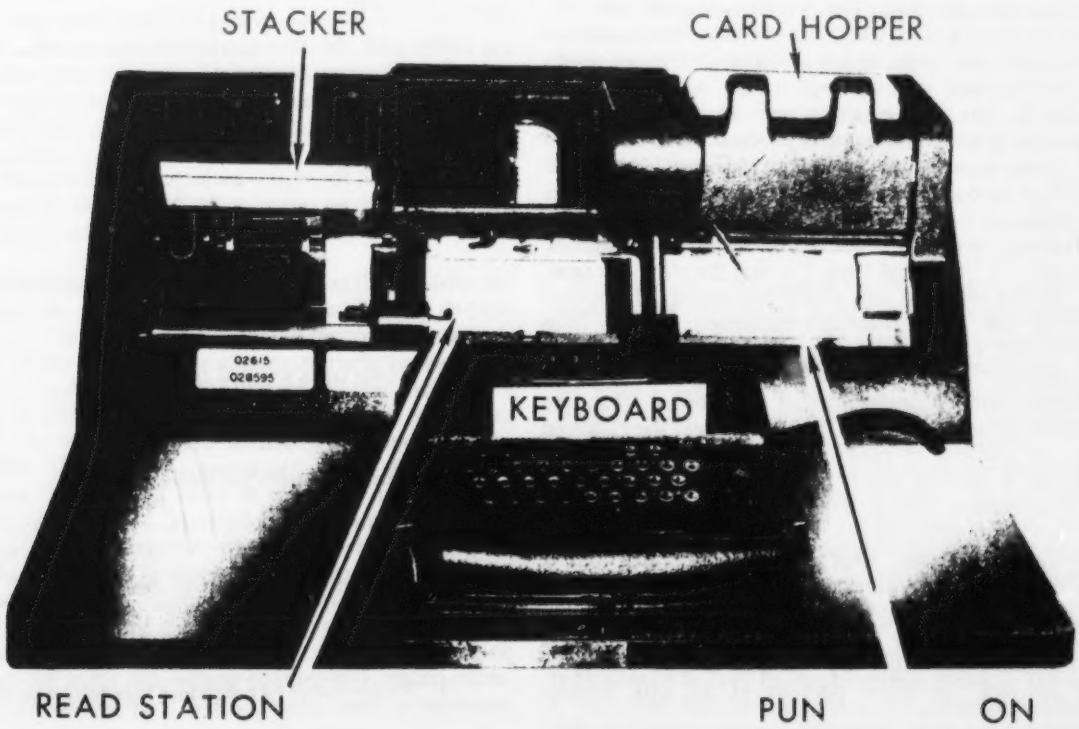

Figure 1–4. Keypunch machine.

2. State the primary function of each of the five components.

204. Identify the configurations of the B–3500 computer system and the use of each and, given specific data processing requirements, determine whether or not the B–3500 can perform the requirements in configuration "A."

B–3500 Computer. The B–3500 computer is one of the computers in the Air Force inventory. It does not require as many PCAM operations as the older generation of computers. Most sorting and selecting is done internally, rather than by the sorter, thus making for greater speed and accuracy. It can use magnetic tape, punch cards, magnetic disks, and remote devices as input media. The B–3500 can do several unrelated jobs at the same time. It is more self-regulating than most of the older computer systems and its programming is simpler. The B–3500 computer phase II system—in operation at most Air Force bases—is either the "A" or the "B" level configuration. Level B is for high workload bases; A level is for lighter workloads. Both configurations contain the following major components: card reader, magnetic tape unit, magnetic disk unit, remote device, and main memory.

Card reader. The card reader is used to input data on punch cards to memory. The A level uses a 200-card-per-minute reader, and B level uses an 800-card-per-minute reader. The card reader serves as the original input device for maintenance data collection and labor-hour time accounting data. An automatic control device will halt processing if the unit becomes jammed. The validity of each character can be checked as it is processed. Usually, at the end of each day's run, the data is recorded on magnetic tape or disks.

Magnetic tape unit. In computer language, the magnetic tape unit can "read and write." Using the magnetic tape, data can be recorded and stored for almost any desired period of time. In the A-level configuration, there are from two to four clustered tape units. The B level uses six freestanding units. Clustered tape units have more electronic and electromechanical components than the freestanding units. Both the freestanding and the clustered units are capable of reading the tape backwards. This capability makes for greater efficiency, since it speeds up or, in some cases, eliminates the need for rewinding when only part of a tape is required.

Magnetic disk unit. Another way of recording data is with magnetic disks. Think of the magnetic disk as being similar to a phonograph record. The magnetic disk has some advantages over magnetic tape in that it allows a random access capability. By "random access," we mean that the unit can select portions of the disk without "playing" the entire disk. This random access capability gives magnetic disks a decided advantage over magnetic tapes in some computer applications. To get data from a magnetic tape may require rewinding large amounts of tape.

Remote device. The remote device is used to request information *from*, or to input information *into*, the computer. It has a typewriter or teletype keyboard that is connected directly to the memory section of the computer. Hence, it can be considered an on-line operation. The remote device is used for maintenance data input from aircraft maintenance and is in common use in personnel and finance operations.

Main memory. The main memory storage unit on the B–3500 computer system is a magnetic-core type housed in a metal cabinet. The main memory storage units on both the A and B level systems look about the same, although the B level can store approximately 50 percent more data (or "bytes" in computer language). Control of the memory core is the same for both the A and the B levels. The control functions in the same way as was explained under basic computer systems earlier in this course.

Exercises (204):

1. What are the two configurations available for the B–3500 computer system?

2. In general, for what is each configuration used?

3. Which of the following data processing requirements is accomplished with the B–3500 computer in configuration A?

   a. Reads tapes forward and backward.

   b. Reads 420 cards per minute.

   c. Inputs data from a remote device.

   d. Makes use of free standing magnetic tape units.

Data Collection System

IT MAKES LITTLE sense to generate, manipulate, and computerize masses of data if the data is not going to be used. The fact is, you will find there are several prescribed systems that are generated by maintenance data. From each of these systems you, as a user of this data, should receive computerized reports.

The VIMS accounting system is designed to compile data received from source documents and to summarize this data in the form of punch cards or printed listings. The first steps in good analysis are to collect accurate data and to transfer the data to the computer free from errors.

In this chapter we discuss the vehicle master records required by the VIMS, the files and tapes they create, how to keep the VIMS up to date, and the computer listings generated by the system.

2-1. Vehicle Master Records

All computer systems require a certain amount of static data in order to accomplish their mission. The VIMS has such static data; it is called *vehicle master records*. Vehicle master records contain information about vehicles which is used to better manage the maintenance activity and the vehicle fleet.

205. Specify the type of information on the vehicle and high-cost bench stock master cards.

Vehicle Static Data Records. The first step taken in the VIMS is to establish master records in the B-3500 computer. The vehicle master records are static data records which consist of three general-purpose cards known as A, B, and C cards. These three cards are required each time a vehicle is added to the vehicle inventory. All static data peculiar to vehicles in the inventory are input into the computer. This creates a permanent record of file in the computer for charging costs of parts and labor to each vehicle, as necessary. Source documents are also easier to complete, because only the vehicle registration number and variable data need to be entered on the forms.

A card. The "A" card is the first of the three vehicle master records. This card identifies the vehicle to the computer, using information such as the registration number, the using and owning command(s), organization, miles/hour/kilometers (M/H/K) units, and replacement data.

There are five transaction codes used with the A card: Z, T, R, D, and C. Of these, the Z code is used to input new vehicles to the system; the AZ must have a matching BZ and CZ card. A T transaction is used to transfer a vehicle from one organization or base to another. Thus a number 1 punched in card column (CC) 17 transfers a vehicle to another organization, while a 9 in CC 17 indicates that the vehicle is being shipped to another base. The AT causes the computer to produce an AZ, a BZ, and a CZ card which must be sent to the new site. The R transaction is used to change only the registration number of a vehicle in the VIMS. An A card with the D transaction code deletes a set of master records. However, a deletion should be used to completely eliminate a record only. All other information needing to be changed is input into the computer with a C transaction.

B card. The "B" card is the second of the three master records. There are only two transaction codes used with the B card; they are a Z transaction and the C transaction. The BZ is for initial input of special inspections. The BC is used to change any of the data fields. Special inspections are listed in TO 00-20B-5, *Technical Manual USAF Motor Vehicle and Vehicular Equipment Inspection*. However, in addition to the items listed in the TO, other special inspections may be determined locally. The responsible office should make every effort to schedule these inspections in conjunction with annual safety and periodic scheduled maintenance. Special inspections will be updated whenever an FZ, NZ, or WZ work order is processed with the appropriate system code.

C card. The "C" card is the third master record. It is used to set up annual safety and periodic scheduled maintenance inspections. The inspection requirements are determined by next due date and M/H/K intervals, which are loaded with the CZ transaction. These data fields are updated when FZ or NZ transactions are processed indicating scheduled maintenance system codes.

The CC card transaction is used to change data in a CZ master record which has been accepted into the system. You should be careful when the CC card is used to adjust M/H/K; in fact, it is not recommended if the correction reduces your miles this period or increases your utilization by any significant amount.

The three vehicle master records are critical to the VIMS in that they show specific vehicles for which the maintenance activity has repair responsibilities. The B and C cards establish basic criteria in the computer to schedule vehicles for preventive maintenance. Now that you have the vehicles identified in the system, there is one other master record that will help you maintain your fleet. This is the high-cost bench stock master record on the E card.

E card. A high-cost bench stock master record is loaded for each item listed as bench stock and having an issue cost of $20 or more. Materiel Control will initiate this record as parts are identified for bench stock by the maintenance activity. The E card identifies parts to the computer, using the national stock number (NSN) or part number, unit price, and element of expense investment code (EEIC). When the E master record is accepted, the computer produces 25 QZ cards, which will charge the cost to the proper work order.

There are two transaction codes used with the E card—Z and D. The EZ is an initial input to the computer, while the ED is used to delete a master record. Any errors accepted on the E card should be deleted, using the ED card, and resubmitted, using an EZ card.

Exercises (205):

1. On what vehicle master card can you find information pertaining to scheduled maintenance?

2. What master cards schedule preventive maintenance inspections?

3. Which master card provides information about vehicle replacement status?

4. How much must a high-cost bench item cost before a master record is loaded?

2-2. Vehicle Integrated Management System Files Update

Earlier in this chapter we talked about establishing permanent records in the VIMS by processing and loading vehicle master records. In this section we will be dealing with the VIMS files and discussing how to keep these files up to date.

The VIMS files contain data on magnetic tapes of all the information required to produce the listings on daily, monthly, and quarterly processing runs. Each file has a name to identify types of data located on that particular file.

206. Evaluate selected data to identify the data file names and where this information is located.

Data Base. The VIMS data base has 10 master files, one file to pass data to Accounting and Finance (A&F), and three quarterly records to summarize and pass data to the Command Air Force Vehicle Integrated Management System (CAFVIMS), Warner Robins Air Logistics Center (ALC). All files are located on tapes. Each file is identified by a file name.

General data record AM, file ARADOP. This file has data for all vehicles at each site and data having to do with the sites themselves. Each site has a record in this file. It is used to keep each site's data, such as assigned labor-hours, reporting command, indirect costs, labor-hours, contract cost, and reporting region.

High-cost bench stock master record Q, file ARADOQ. This file is the internal master file of high-cost bench stock records. The data is the same that is input on the E card and make the Q cards for work order high-cost bench stock parts charges.

Vehicle master record C, file ARADOF. The vehicle master file keeps data for each vehicle assigned to each site. The data is both static and cumulative. The static data changes rarely. Information contained in the file—such as vehicle registration number, life expectancy in years, and vehicle equivalents—is obtained from the vehicle master A, B, and C cards. The cumulative data can change daily; this applies, for example, to M/H/K, system and action taken codes, fuel/oil usage, 6 months' average fuel use, and VDM–VDP–VOC hours. This data identifies a particular vehicle's record in the computer.

Employee master file E, file ARADOJ. This file is the internal master file of employee records. We will discuss this master card in learning objective 209.

Open work order master, file ARADOM. The data remains until the work order has been closed 6 processing days and then goes to the closed work order file. This file collects data on each work order input to the VIMS during the month. It has six record types set up by the card types that are input to make and collect data on work orders. The record types are GF—Work Order Header, with work order and vehicle data; GG—Direct Labor, with the direct labor-hours for the work order by employee and job number; GP—COPARS, with P card for charging parts to the work order; GQ—High-Cost Bench Stock, with parts charges by Q cards; GV—U1050–II Parts, with parts charges by VIM cards; and GW—Work Order Close, which collects systems codes, estimated hours, direct hours, action codes, and delayed maintenance codes from the W card.

Delayed maintenance record J, file ARADOR. This file holds delayed maintenance hours and maintenance delay codes by work order number.

A&F direct labor transaction record, VIL, file ARAD1C. The VIMS collects data in this file and passes it to A&F on a monthly tape. Data is collected on refundable/reimbursable vehicles only and give labor-hours and costs by registration number, RC/CC, EEIC, and work order number.

A&F nonlabor direct transaction record, VIM, file ARAD1C. The VIMS collects data in this file and passes it to A&F on a monthly tape. Data is collected on refundable/reimbursable vehicles only and give parts costs by vehicle registration number, RC/CC, EEIC, and work order number.

Deferred parts file P or V, file ARADOI. This file holds parts costs received until they are charged to the work order by an S card. The file holds parts costs received on P, COPARS or V base supply parts charge cards for delayed maintenance work orders.

Quarterly summary and detail records. These records have detailed VOC–VDM–VDP, repair costs, direct-labor hours, M/K/H traveled per period, totaled by replacement code groups within management code groups.

Exercises (206):

1. What file contains information about a site's assigned labor-hours and reporting command?

2. Information pertaining the VDM–VDP–VOC hours is found in what file?

3. The record labeled "GG—Direct Labor" is found in what file?

4. Which file gives labor-hours and collects data on refundable/reimbursable vehicles only?

5. Information about a vehicle's life expectancy in years and the equivalents is located in what file?

207. State the purpose of each computer tape used in the VIMS and identify data contained on the VIMS master files and each tape.

VIMS Tapes. The computer tapes used in the VIMS are the means for data storage. This system of storing data is extremely useful in areas where you may need to reestablish a master file because of errors or some other misfortune. You can retrieve data easily and quickly when you know exactly where your information is located.

Tape ARAD6T (master files). The master files are loaded on this tape. Whenever you process A, B, and C cards for a new vehicle or an E card for high-cost bench stock, etc., you are updating the master files.

Tape ARAM7A (vehicle historical file). This tape contains vehicle maintenance historical data in a monthly sequence. It has 12 months of static and cumulative data.

Tape ARAM7B. This tape has 3 months of vehicle management code summary and detail records. Information stored on this tape is used to build quarterly tapes. However, this data is stored in monthly segments and can be used to reestablish any month processing cycle for a current quarter.

Tape ARAM8A (annual closed work order file). This tape is updated monthly from the daily tape. This is the only tape which contains detail work order information of accumulated data in a monthly sequence for a 1-year period.

Tape ARAQ5T (quarterly correction cycle). This is the first tape of the quarterly run. It is generated from the ARAM7B tape, which is in exactly the same format as the ARAQ5T. If no corrections are necessary in the quarterly tape, then the ARAQ6T tape is produced.

Tape ARAQ6T. This is the tape which produces the quarterly reports. It is also mailed to Warner Robins ALC to be included in the Command Air Foce Vehicle Integrated Management System (CAFVIMS).

Tape ARAR1T (site relocation). This tape is the least talked about and least used tape in the VIMS. However, it could be the most important tape you could use if your site had to be relocated. The ARAR1T tape is produced by the data processing installation; it contains a copy of each current tape on your site. The production of this tape should save you many hours of reloading vehicle master records and trying to update them.

Relationship of Files to Tapes. In the interest of simplifying what VIMS files are located on each tape, study the following correlation list carefully.

File Name	*Tape*
ARADOP	ARAD6T and ARAM7B
ARADOQ	ARAD6T
ARADOF	ARAD6T, ARAM7A, and ARAM7B.
ARADOJ	ARAD6T
ARADOM	ARAD6T and ARAM8A
ARADOR	ARAD6T
ARAD1C	ARAD6T
ARADOI	ARAD6T
Quarterly Summary Record	ARAQ6T

Exercises (207):

1. What is the purpose of the ARAM7B tape?

2. The ARAD6T tape contains what master files?

3. What is the ARAR1T tape used for?

4. Why is the ARAQ5T tape produced?

5. What tape is included in CAFVIMS?

208. Identify the information contained in the transient vehicle return report, state the source of the information contained in this report, and explain what a transient vehicle is.

Transient Vehicle Return Report. This report is produced daily and is used to monitor repairs on vehicles

which are not assigned to the base. In the Air Force, we have what is called an interservice agreement. This means we provide repairs for any Department of Defense (DOD) vehicle and then bill the responsible agency. These are referred to as transient vehicles. But Air Force vehicles from other bases repaired in your shop are not billed for repairs. The agreement calls for Air Force bases to support each other without exchange of funds.

Monitor your transient vehicle return report to insure that your shop does not spend excessive labor-hours and cost on transient vehicles. If this should happen, bring it to the attention of the VMO/superintendent for corrective action.

The information contained in this report is taken from the AF Form 1823, Vehicle and Equipment Orders. When the work order is removed automatically from the work order master file, note that it will appear on the transient vehicle report. The following information appears on the transient vehicle return report. (Always look for specific data pertaining to the work order.)

a. Work Order Number. Print an X in this column to show the home base that this is a transient vehicle return work order and that a local number needs to be input.

b. Vehicle Registration Number. Enter the vehicle registration number here.

c. Current M/H/K. Add the M/H/K information in this column.

d. Date Released. Put the data released here.

e. Contract/Other Government Agency Cost. Supply this cost in this column.

f. Labor Costs. Enter here the cost of labor-hours taken from the closed work order multiplied by the repair site's direct labor-hour wage rate. No entry is required for contract or other Government agency repairs.

g. Material Costs. Put the cost of parts from the PZ, QZ, and JZ in this space.

h. Scheduled Maintenance. Provide here the system code(s) for the scheduled maintenance that was done. These codes update the home base scheduled maintenance report.

i. VDM Hours. Print the VDM hours in this column.

j. VDP Hours. Fill in the VDP hours here.

k. OGA IND. Supply an indicator in this column to show that the work was done by another Government agency.

l. ACC IND. Provide an indicator in this column to show that repairs were required because of an accident.

m. CNT IND. Put an indicator in this column that shows the repairs were done by Contract Maintenance.

n. Work Order. Enter here the work order number that is assigned by the base doing the repairs.

o. Base SRAN Code. Print the stock record account numbers of the vehicle's home organization in this column. This is taken from the vehicle Servo O Plate and input on the FZ card.

There are other special procedures that you should remember for handling a transient vehicle. For example, Data Automation provides you with a prepunched card which you must review and mail to the vehicle's home base MC/A office. When you accept the vehicle into the maintenance shop, make sure that you get the mailing address from the vehicle operator. Always send a copy of the work order, together with the N card, to the home base. If the vehicle is non-Air Force, you must send one copy of the work order to the home base.

You should use an NZ transaction, transient vehicle card, to input all scheduled maintenance accomplished off base on an AF Form 15, United States Air Force Invoice, or SF 149, U.S. Government National Credit Card.

Remember to check the NZ card for accuracy. Mail it to the home base if it is a VIMS vehicle and mail the work order if it is non-VIMS. Also, when you receive an NZ card in the mail, input it into your system.

Exercises (208):

1. What system codes are punched on the NZ card?

2. How is the cost of a transient vehicle work order printed on the transient vehicle return report?

3. What is considered to be a transient vehicle?

2-3. Employee Master Records

The employee master records serve the same purpose for employee identification as do the vehicle master records in identifying vehicles.

209. Identify the information contained on the employee master card and give its purpose.

Employee Master D Card. This card is made for each employee assigned to the labor-hour accounting system. There are four different transaction codes used with the D card. The DZ initially loads a new employee. The following information is on the DZ card: the employee name, employee number, rank/grade, assigned labor code, hourly labor rate, AFSC, available hours, and work center.

The DF transfers an employee from one work center to another or transfers an employee off the site. However, if an employee is transferred from the system, the employee number is not reused for 120 days. This is to allow for proper reporting of all the labor-hours for that employee during the assigned period. The DD transaction, on the other hand, is used to delete an employee's record. The DD transaction is used only if there are no labor hours processed for that month. The DC transaction is used to change data in the master record that is not changed by a DF or DD.

Exercises (209):

1. What is the purpose of the employee master card?

2. List the information on the employee master card.

210. Identify the employee master file by file name and specify how the file is updated and the documents used in updating it.

Employee Master File, ARADOJ. This file contains all of the information that you input on the D master card. The file also contains information on direct hours, indirect hours, direct overtime hours, indirect overtime, and proration of estimated hours. This file is updated monthly from the timecard submission and hours documented on the work orders.

Exercises (210):

1. What is the file name for the employee master file?

2. How often is the employee master file updated?

3. What documents are used to update the employee master file?

211. Explain how the employee master list is used and what data are used to obtain the indirect wage rate and state how the direct wage rate is computed.

Employee Master List. The employee master list is prepared in accordance with the instructions supplied in AFM 77-310, Vol. 3. The data contained in this report are obtained from each employee master card you submitted to Data Automation. The employee master list is used as a quick reference list to check for proper work center and labor code assignments. The following information will appear on the employee master list.

a. Work Center.
b. Employee Name.
c. Employee Number.
d. Transfer Date.
e. Grade.
f. Primary AFSC.
g. Assigned AFSC.
h. Authorized ASC.
i. Labor Code.
j. Hourly Wage Rate.
k. Assigned Man-Hours.
l. Civilian Assigned Man-Hours.
m. Military Assigned Man-Hours.
n. Total Assigned Man-Hours.
o. Work Center Assigned Man-Hours—Civilian.
p. Work Center Assigned Man-Hours—Military.
q. Work Center Assigned Man-Hours Total.

The employee master list is printed monthly in the following sequence: Work center (major)—i.e., 17231, 17232, 17233; then labor code (intermediate)—i.e., 01, 02, 20. The third item in print sequence (minor) is the employee's last name. The employee master list gives you the total labor-hours assigned within a work center for each labor code. This information is printed in the far left column of that list, with a single * identifying the total civilian, total military, and total labor-hours for the labor code.

This procedure is repeated for each labor code within the work center. Each work center is then totaled to show total civilian, total military, and a total labor-hours for the work center. These figures are located on the right side of the report and identified by two **. After all work centers within the shop are printed, a total for all personnel within the shop is printed. This total is identified by three *** and shows a civilian, a military, and a shop total. This information is also listed on the right side of the report. Found on the left side of the last page of the report are the average hourly wage rate and the indirect hourly wage rate.

The hourly wage rate is calculated by the B-3500 computer for bases supported by VIMS. If you are operating under the SHORT VIMS concept, then compute the hourly wage rate manually.

When you compute the average hourly wage rate, include only the personnel cost from work centers 172XX. The civilian personnel office provides you with a copy of the annual salaries for each grade you have assigned. From this, determine the hourly salary for each civilian employee by dividing the total annual salary by 2,080 hours. Repeat this procedure for each civilian employee assigned. Once you have the wage rate for each civilian employee, increase each rate by 29 percent. This increase is for leave and fringe benefits.

Example: $12,284.34 annual salary
$ 2,080 average available hours
$12,284.34 ÷ 2,080 = $5.91 per hour
$5.91 x .29 = $1.71
$5.91 + $1.71 = $7.62

For military, the hourly computation is given in AFM 171-101, *Automated Data Reports Submission System (ADRSS): S024/AA, Vol. 2 (Not Phase IV)*. MC/A obtains the military rates from A&F. To get the average shop rate, add the wage data for all military and civilian employees, and then divide the total by the total number of employees assigned.

The indirect wage rate is computed by the B-3500 computer, however, different data is used. To compute this rate manually, total all of the costs of the low-cost bench stock items issued, and total the indirect maintenance productive man-hour costs. Finally, total these costs and divide by answer by the total direct productive labor-hours expended.

By keeping the listing error-free, you assist management at all levels within the maintenance complex.

Exercises (211):

1. How do you use the monthly employee master list?

2. What two cost factors determine the indirect wage rate?

3. Briefly explain how the direct wage rate is computed.

4. Who provides the military wage rate?

Data Inquiry System

THE BASE VEHICLE inquiry system is designed to provide users of the B-3500 Automated Management Supporting Data System (AMSDS) with an effective, simple to use, and flexible information-retrieval capability. The base vehicle inquiry system is applicable to all bases using AMSDS, which means that the maintenance data files are accessible.

3-1. Programmed Inquiries

The programmed inquiries are written into the VIMS to simplify your job of retrieving data quickly and in easy-to-read format.

There are several programmed inquiries. You should become familiar with the information on each inquiry. The instructions for obtaining this data is located in AFM 77-310, Vol. 3. These inquiries are not covered in detail in this CDC, because we are only concerned here with how to interpret the products obtained from the programmed inquiries.

212. Given selected situations, determine the kind of work order inquiry report and procedure that is required in each situation.

Work Order Inquiry Report. The maximum number of parameter cards that can be input for a single processing run is 100, including all sites; that is, if site A processes 50 inquires, then sites B and C can process 25 each.

This report is made for a single work order, a group of work orders (by vehicle registration number), or all work orders for a site for up to 1 year.

This report can be used in conjunction with the maintenance management report. When you are analyzing the fleet statistics or reviewing individual vehicle performance and suspect that some costs or VDM figures are too high, you can request this inquiry. The work order inquiry will provide you with the detailed work order information you will need when looking for underlying causes of problems. You will receive data about miles, hours, VDP, VDM, VOC, delayed maintenance, maintenance costs, materiel costs, job hours, estimated hours, action taken codes, and system codes that affect a particular vehicle or work order.

Exercises (212):

1. The vehicle maintenance officer wants all action taken codes R for the system 01, as well as VDP and VDM hours for the past 3 months. How can you obtain this information?

2. The maintenance superintendent wants all VDM hours for a particular organization for the past 12 months. How will you get this information?

213. Name two data inquiries, state the purpose of one, and determine the maximum number of static data inquiries that can be requested at one time.

Vehicle Static Data Inquiry. This inquiry gives you information contained on the vehicle static data file. This is the information you input with the A, B, and C cards when the vehicle is loaded into VIMS. You can obtain this inquiry on a single vehicle by using the registration number. You have a limit of 100 inquiries per run. If you leave out the registration number on the inquiry, you will receive a printout of the whole fleet.

The main purpose of the vehicle static data inquiry is to monitor the scheduled maintenance intervals. The output listing shows the next due date and interval for lube/oil/filter, special, and safety inspections. It also lists the replacement miles and life expectancy years which were initially loaded.

High-Cost Bench Stock Listing. This inquiry shows all the items on the high-cost bench stock master file and is printed in NSN sequence. It shows the unit price, EEIC code, and charge code. This listing is normally run to assist Materiel Control in validating the high-cost bench stock items.

Exercises (213):

1. What is the purpose of the high-cost bench stock inquiry?

2. Name the two data inquires.

3. What is the maximum number of static data inquiries that can be submitted in a single processing run?

3-2. Air Force On-line Data System Products

All VIMS files are used to provide nonstandard, nonrecurring special data products on an as-required basis. You develop these data products through the Air Force online data system (AFOLDS). The AFOLDS will provide you information from the VIMS files in whatever format you desire.

While AFOLDS is designed for on-line systems, we in Vehicle Maintenance can still process our retrievals through a PSEUDO mode. As off-line users, you will be punching your retrieval statements into cards, inserting them in a batch information retrieval facility (BIRF) input deck and taking that deck to your DPI.

214. Explain each data entry of the BIRF card deck and identify the format for this deck.

BIRF Card Deck. The format for this deck is simple; it consists of five mandatory cards. Your deck should look like this.

```
?EXECUTE NSYR90
?DATAASYR9C
*START R1 RA
R, PSEUDO ORG LGTM
    (RETRIEVAL STATEMENTS)
?END
```

The ? in the EXECUTE, DATA, and END cards can be any invalid character. Multipunch 1, 2, and 3 in card column 1 is suggested. The NSYR90 is a program number which enables you to run PSEUDO retrievals in an off-line mode. The ASYR9C in your data card is for internal use only; it identifies the print mode. Column 1 of the start card will always be "*," followed by the word START; then, R1, which represents the input mode. The RA is your system code, of course; for us this is the VIMS. Your PSEUDO statement marks the beginning of the retrieval control statements within each PSEUDO deck. This statement is used to input an organizational symbol; for us this will be LGTM. You are limited to six characters for this entry. Your actual retrieval statements will follow the PSEUDO card; however, we will cover the construction of these individual statements in learning objective 215 through 218. The END card alerts the computer that your retrieval program has been read into the machine, and processing can begin now.

Exercises (214):

1. List the sequence of the BIRF card deck.

2. Explain the purpose of program number entry in the EXECUTE card.

3. The PSEUDO card serves what purposes?

4. Explain the R1 and RA entry in the START card.

215. Explain the entries in selected retrieval statements and identify the proper sequence of these statements.

Retrieval Statements. Eight basic statements are common to most retrievals. Let's list a very basic retrieval to get selected information from our VIMS files. Here it is:

```
?EXECUTE NSYR90
?DATA ASYR9C
*START R1 RA
R,PSEUDO ORG LGT
R,TFUL-CS
000100 INPUT A-VEH
000200 OUTPUT TO PRINTER SEND TO "LGTM-JONES"
000300 SELECT ALL
000400 SORT VA-ASGN-ORG VA-MGMT-ID VA-RE.-NO
000500 DISPLAY VA-REG-NO VA-OFF-B-GAL VA-OFF-B-CST
000600 END-OF-TEXT
R,R FUL-CS
?END
```

Now let's discuss our first retrieval step by step. First, we must decide what we want. In this retrieval, we will take a look at off-base fuel consumption and cost.

The first card of our actual retrieval statement is the TEXT or R,T FUL-CS. Note that we did not have to spell out the word TEXT. The purpose of your text card is to assign a name to your retrieval. There cannot be two retrievals in the file with the same name. It seems only proper to name this retrieval FUL-CS. Your field size for the retrieval name is limited to three to six characters, with the first being an alpha character.

Each card after the text statement must start with a six-digit sequence number. However, you cannot use all zeros or all nines. We recommend that you leave plenty of room between numbers for additional cards, or in situations where you want to expand a statement. In our example, the first sequence number is 00100 in the INPUT statement. This statement tells the retrieval system what file(s) you are extracting.

For this retrieval, we will be using the A-VEH files on the ARAM7A tape. Now that the computer knows where to look for our information, we can start getting more specific.

The OUTPUT statement specifies where you want your output product to go, (CRT, printer, disk). In this case, we want a listing, so we simply specify the output to the printer. Also, in this statement the Send To instructions tell DPI what to do with your product. Your office symbol, name, and phone will do just fine. But you have up to 40 characters only for this area.

Our next statement is SELECT. This card tells the computer what criteria a record must meet before it will be used in your retrieval.

Because we want fuel and cost on all of our vehicles, we will select ALL; this is the short title for SELECT ALL RECORDS. Once the computer has selected all the vehicle records in our file, we'll want to put them in some kind of logical order. The SORT statement is used for this task. What we do here is line up the vehicles by assigned organization, put in the management code order within the assigned organization, and put the registration numbers in order within the management code and organization. This sounds like a mouthful for the little work it takes to do all of this, but it really is that simple. So far, all we have accomplished with these statements is to show the computer where our information is located, identify what information to select, and put that information in some logical order. With our next card, the DISPLAY statement, we will tell the retrieval system exactly what we want on our output product. Keeping our problem in mind, just what do we want to look at? The answer is fuel consumption (off-base), cost for that fuel, and which vehicles are using this fuel, so this is what we'll print. Since this is all the information we want, we must now tell the computer that we are finished with the retrieval statement. The END-OF-TEXT card will do just this. This statement marks the end of your statements only. We still have two more cards to add before we are ready to run. Our next card is R, R FUEL-COST. This is your run request for the retrieval named FUEL-COST. Finally, after all of these instructions are given to the computer, we must tell the computer we are through giving it instructions. Our last card will do this job; the ?END card identifies to the retrieval system that you are finished giving instructions.

Even though this is the most basic of retrievals, you can see that it's easy to obtain any data from the VIMS files. A word of caution here: When you list your DANs, make sure you copy them exactly as they are in your DAD table. Also, sequence your statements as shown in our example.

Exercises (215):

1. Explain the entry in a TEXT statement.

2. What are the field limitations for the TEXT statement?

3. Explain a A–VEH entry of the INPUT statement.

4. Unscramble the following list of retrieval statements to put them in the correct sequence: SORT; DISPLAY; SELECT; INPUT; DATA; R, PSUEDO; R, TEXT; ?END; R,R FUL–CS; END-OF-TEXT; OUTPUT; EXECUTE; START.

216. Explain the purpose and use of the USE, BREAK, and DISPLAY retrieval statements.

USE Statement. This statement will define a temporary name. Usually, the names used in your files do not read very well, so many times you will want to change a file name to something that is more understandable to other people not familiar with the VIMS files. There are many conditions for the USE statement. However, we are going to discuss only the basic format. Two of the options you will be using most often are the TALLY and TOTAL. Let's list some examples, using VIMS files. In our first retrieval, we want to look at fuel GAL,consumption (off base), fuel cost, and registration; these are VA–REG–NO, VA–OFF–B–GAL, and VA–OFF–B–CST. These names are not very descriptive to anyone reading your output product. Your statements should look like this.

```
000210 USE VA–REG–NO AS REG–NO
000215 USE VA–OFF–B–GAL AS OFF–BASE–GAS
000220 USE VA–OFF–B–CST AS 0/B–GAS–COST
```

Now that we have assigned our temporary names, when we want to print our information, all we need to do is refer to the temporary name, and that's the way it will print out.

Of course, we could have called these file names anything we wanted to call them. But there is a limitation on this field size—temporary names can be from 1 to 12 characters long, with the first being an alpha.

TALLY. This option is very simple to use and allows you to tally alpha/numeric data fields. The following example shows a USE statement with the TALLY option:

```
000210 USE REG–NO AS TALLY OF VA–REG–NO
```

This statement will add up all the registration numbers and give you a subtotal or grand total.

TOTAL. This option is just as easy to use as the TALLY statement. One difference here is that you can add only arithmetic data fields. Using this option, we can add all of the gallons of fuel consumed to show us a total consumption figure. For example:

```
000211 USE OFF–BASE–GAS AS TOTAL VA–OFF–B–GAL
```

This statement will add all the gallons of fuel in these data fields and give a total.

BREAK Statement. You can use this statement to set up spacing between major items to be printed. For example, in our original retrieval, we had our information sorted by assigned organization, management code, and registration

number. Now let's say that we want our listing to print all the vehicles assigned to each organization on base, with spaces between each different management code. All you have to do is follow this simple format:

```
000510 BREAK ON VA-ASGN-ORG AT END SKIP 2 LINES
000511 ON VA-MGMT-ID
```

Notice here how we used the DANs (Data Descripton Numbers). Also we could have used a temporary name assigned in the USE statement. One very important factor you must remember about this statement is that you must BREAK on the same names you specified in your SORT statement, and in the same order. That is, our SORT statement specified assigned organization, management code, and registration number. So, our BREAK statement must state the assigned organization first; second, the management code.

There are several options you can see with this statement. For instance, we specifically wanted two lines skipped between organization codes, so we simply put that condition in our BREAK statement. Another option we could have used is the RESET clause. However, if you use RESET, you must have a TALLY or TOTAL clause in your USE statement. Here we had a tally of registration number. This would give us a count only of all the registration numbers in our files, which is "nice" but not of much use. We could have used a RESET clause in our BREAK statement and have had a tally of registration numbers assigned to each different organizational code. For example:

```
000510 BREAK ON VA-REG-NO RESET REG-NO
```

Each time a break name is read, the counter will start counting until the next break name appears; at this time, the count will be set back to zero. Also, we could have had total gallons consumed per organization.

DISPLAY Statement. This is the statement that really puts your retrieval printout in the format you want. The display detail statement specifies the format you want. The display detail statement specifies the format for each detailed line of print. Using this statement, you can specify print positions, column headings, and editorial pictures.

So far in this section, we have been describing information for the computer to find and telling the computer what we want to call our data fields. With this statement, we will be actually having the computer put our information where we want it printed. So let's get started. Here is a very basic display statement.

```
000500 DISPLAY VA-REG-NO VA-OFF-B-GAL VA-OFF-B-CST
```

What this statement will give us is column headings using the DANs. But this wouldn't look very good on the top of our listing. So let's change it and use temporary names.

```
000500 DISPLAY REG-NO OFF-BASE-GAS 0/B-GAS-COST
```

This is a little better, but let's improve on it, too:

```
000500 DISPLAY ORG-CODE MGT-CODE REG-NO
OFF-BASE-GAS 0/B-GAS-COST
```

This is also good, but we have used only 50 or so print positions. What about all the blank space? Consider this:

```
000500 DISPLAY VA-ASG-ORG AS "ORG" POS 1
000501 VA-MGMT-ID AS "MGT COD" POS 10
000502 VA-REG-NO AS "REG NUM" POS 2
000503 VA-OFF-B-GAL AS "O/B GAS" POS 30
000504 VA-OFF-B-GST AS "O/B CST" POS 40
```

By assigning position numbers, we have control over where our information is printed. We can also set up column headings centered over the data field, using the full construction of the display statement.

For detailed instructions on each retrieval statement and all of the options available, refer to AFM 171-177, *Air Force Online Data System (AFOLDS) System Command Language (SCL) and Retrieval Language: P818/SY, Vol. 2*, Users Manaul.

While the AFOLDS was developed to assist you in your duties, you must remember that writing retrievals is time-consuming and costly to run. Therefore, it is your responsibility to limit your request to only absolutely essential information. Far too often, we process lengthy retrievals when we could have used reports already in our office.

Exercises (216):

1. What is the USE statement used for?

2. What is the limitation on temporary names?

3. What is the purpose of the TALLY option?

4. What restriction is on the TOTAL option?

5. If a BREAK statement is specified, what other conditions must be met?

6. Explain what the RESET option will do?

7. What is the purpose of the DISPLAY statement?

217. State the primary purpose of the TALLY statement, and specify the rules for the construction of the TALLY and TOTAL statements in the BLIS.

TALLY Statement. The TALLY statement serves two purposes: (1) It gives the user a record count by sorted groups of records at controlled breaks in the report. These controlled breaks are called TALLY BREAKS. Breaks occur each time there is a change in the values of the data element name that was specified in the TALLY statement. (2) When both TALLY and TOTAL statements are specified in a BLIS request, the TALLY statement causes subtotals to be printed at each tally break for each DEN specified in the TOTAL statement. The construction of a TALLY statement is:

TALLY ON ORG–CD VDM VDP

The key word is TALLY, which is followed by the DENs on which you want tally breaks. The word ON is optional and is used for readability only. A maximum of six data element names are specified in the TALLY statement.

TOTAL Statement. The purposes of the TOTAL statement are to cause the computer to accumulate the values of specified numeric data fields and to print the total of each data field at the end of your report. Only those data fields that are described as numeric are specified in the TOTAL statement. The construction of the TOTAL statement is:

TOTAL VDM VDP

The key word is TOTAL, followed by the numeric DENs VDM and VDP. This statement causes the computer to accumulate the hours in these fields and to print them at the end of your report.

Exercises (217):

1. What is the primary purpose of the TALLY statement?

2. What do the TALLY and TOTAL statements cause when they are used together?

3. What is the maximum number of data element names that are specified in one TALLY statement?

4. What is/are the only type(s) of data fields that is/are used in the TOTAL statement?

218. Identify the construction rules of the DEFINE statement and specify the use of this statement in the BLIS.

DEFINE Statement. If you do not have DEN tables loaded at your base, then you must use the DEFINE statement. The DEFINE statement assigns a temporary name to a literal or a data field that is not already defined in your DEN table. To set up a DEFINE statement, refer to AFM 77–310, Vol. 3. Locate the file you need and the desired information you want selected from that file. Each item you want selected must have a DEFINE statement. The following is an example of a DEFINE statement.

Column 1. Print the word DEFINE.

Column 7. This is blank.

Column 8. Assign a temporary name to the data field you desire. There are NO spaces in the name, and the name field has a maximum of 12 digits. However, all 12 digits need not be used. Skip one space after the temporary name field, write the word TO, skip another space and write the word BE; skip a space, and put the type/class of data listed in the data file; for example, AN–AL–UN. Place a colon next (:), the first position of the record on the tape, a colon next (:) the length of the data field, and another colon (:). You should have three colons and no spaces from the type/class to the field length.

Your DEFINE statement should resemble the following sample:

DEFINE RECID TO BE AL:1:1:

DEFINE AV–HR–WG–R TO BE UN:13:4:

The key word is DEFINE. The temporary name must be unique (not used in the system before). The words TO BE are mandatory with this statement. The AV:1:1: is a data element descriptor.

To use the BLIS properly, you must have a thorough knowledge of the VIMS. Follow the instructions given in AFM 171–114, *Base Level Inquiry System (BLIS): P107A/R1*, Vol. 2, Users Manual, for instructions in writing a BLIS statement. When you use the five mandatory statements, along with the two optional statements presented here, you will obtain a simple BLIS report. However, by learning the other optional statements, you can increase the value of all your BLIS reports.

Exercises (218):

1. What is the purpose of the DEFINE statement?

2. What is the maximum length of a temporary name used in a DEFINE statement?

3. How many colons are required in a DEFINE statement?

4. In addition to the key word DEFINE, what are the other mandatory words that must be specified in the DEFINE statement?

5. How many DEFINE statements are required to produce a BLIS report?

Standards Analysis

THE FORMAT presentation you are required to give is designed to inform managers how well the performance indicators are going. This presentation should point out areas which need improvement and suggest possible courses that can be taken to correct the substandard areas. In this chapter, we will look at these indicators and some problems that you may encounter and, also, the possible corrective actions that may be taken to correct any deficiencies.

4-1. Standard Analysis

One of the performance indicators you will be dealing with is the labor-hour utilization and cost for labor-hours.

219. Cite procedures you would follow in conducting man-hour utilization analysis.

Man-Hour Utilization. Man-hours utilized in the vehicle maintenance activity are analyzed to determine whether assigned personnel are effectively used. This is a mandatory indicator that deals with three areas: productive (01 and 02), indirect productive (20–23), and indirect nonproductive (41–43, 51–56).

To analyze man-hours used, you must go to the Man-Hour Utilization Report (PCN N310028), which we have covered previously. As you know, the hours are broken out in this report in two different formats. Part I covers the man-hours that were used by the work centers. Part II covers the man-hours that were used by the entire maintenance complex.

It is best to make three control charts showing the percentage of total hours assigned—one for each of the previously mentioned categories of labor. Since there are no Air Force standards for these indicators, develop control limits using the last 12 months of your base's data. It is best to use a control chart with floating controls to portray these percentages.

Your charts will depict the level of performance of all personnel assigned to the maintenance activity. If the percentage attained exceeds the established controls of your chart, identify those work centers that caused the activity to exceed the standard. Check for low-skill levels and any other abnormal conditions affecting personnel. Check for changes in supervisory personnel that may have affected productivity. Check for proper workload scheduling.

Brief the maintenance officer/supervisor of your findings and use a maintenance referral letter to identify any problems you have uncovered. This will enable this person to investigate the problems and provide solutions to the transportation officer at the monthly briefing.

When analyzing man-hour data from each work center, do not compare one work center with another. Each work center has different mission requirements; therefore, you should compare current data for each work center with past data for that work center. It is the responsibility of work center supervisors to know where their people are and what they are doing.

Exercises (219):

1. What are the three categories of labor that must be analyzed?

2. What types of charts are used to show man-hours for an activity and a work center?

3. Name the three indicators that you would investigate if an activity failed to meet the man-hour standards.

4. What report would you use to gather data for analyzing man-hours?

220. Given necessary maintenance data, calculate the utilization rate for a work center and define selected terms.

An indication as to whether or not the personnel in a work center are being effectively used can be found by computing the *work center utilization rate*. To compute this rate, two distinct functions must be performed. First, basic man-hour cost data needs to be determined; second, the utilization rate itself can be computed.

Basic Man-Hour Cost Data. You can expect several hours in every month to be used for nonproductive or nonmission essential requirements. Each individual in each work center may have different reasons for some of this "nonavailable for prime mission maintenance" time. However, it has been found that certain things are fairly common. It is these common man-hour cost factors that we

will now discuss. Some discussion will be given to the less common cost factors in the man-hour utilization section.

In the Air Force, maintenance personnel work, variously, a 40-, 44-, 48-, 52-, 56-, 60-, or a 72-hour workweek. The number of hours worked depends on many factors, such as the location of the operation, the sensitivity of the mission, and whether a peace or wartime situation is involved. Most commonly though, the 40-hour workweek is the general working span for most of our vehicle personnel. This is not to say that personnel don't put in more than 40 hours per week on the job. But for basic computations, we will exclude the occurrence of overtime man-hours. The calculations of basic man-hour availability cost factors will be determined with respect to a 40-hour workweek.

First, you must understand the concept of the average of all factors on a monthly basis. You know that the months of the year have 28, 29 (leap year), 30, and 31 days. On the average, there are 30.44 calendar days per month. This was figured to include the 1 year in every 4 that February has 29 days.

$$\frac{365 + 365 + 365 + 366 \text{ days/year}}{12 + 12 + 12 + 12 \text{ months/year}} = \frac{1461}{48} =$$

30.4375, or 30.44 average days/months

Second, using this average-per-month concept will, of course, cause some deviation between *actual* and *computed* cost factors. However, over the long haul, the figures should give a good average indication of man-hour cost availability factors.

Let's continue now in the calculation of our cost factors. Beginning with our 30.44 calendar days per month and assuming a 40-hour workweek, we can start subtracting those hours that seem to be commonly lost to most situations.

First, since you are assuming a 40-hour workweek, it is necessary to subtract the relief days. Relief days are Saturdays, Sundays, and compensation days off for working on these days. Of the 30.44 days in the average month, how many are weekend days? If you divide 1461 (the number of days in 4 consecutive years) by 7, you find the number of weeks in 4 years. Then, if you divide this figure by 4, you will get the average number of weekends in an average year.

$$\frac{1461 \text{ days/4 years}}{7 \times 4 \text{ days/week} \times \text{years}} = \frac{1461}{28} = 52.18 \text{ weekends}$$

Multiplying by 2 days per weekend gives $52.18 \times 2 = 104.36$ relief days per year. Then, dividing by 12 months per year you get $\frac{104.36}{12} = 8.70$ relief days per month on the average.

Second, holidays are another common factor that can be determined. Air Force recognized holidays are New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day, and Christmas. These 9 days divided by 12 months per year give us $\frac{9}{12} = .75$ of a day per month on the average.

Now, third, if you subtract the relief days and holidays from the calendar days in a month, you obtain the assigned days per month: $30.44 - (8.70 + .75) = 20.99$. Therefore, you have 20.99 assigned workdays per month when working a 40-hour workweek. Multiplying 20.99 by 8 hours per day gives you 167.92, or 168, work-hours available for all duties during an average month.

However, individuals have other time during which they will not be able to perform in their primary duty. Thus, fourth, using past data, we can determine that 29 hours per month on the average are spent in training, miscellaneous organizational duties, leave, pass, and time for medical treatment or illness. If you subtract 29 from 168 you obtain 139 hours. This is the time a typical maintenance person is available to perform work in primary duties. These cost factors are just man-hours, but when they are used in conjunction with the number of people assigned to a specific function, you can determine how many man-hours can be supported by that function.

Man-Hour Utilization Computation. Now, we need to determine the work center *man-hour utilization rate*, which is the percentage of available direct productive man-hours expended in direct labor. Let's take a general-purpose shop as an example. First, we need to determine the number of man-hours available to this shop for maintenance. There are 10 people assigned to the shop, none of whom perform 01 labor. The double asterisk total on the Employee Master List shows that 1440 man-hours are assigned for direct labor. We know, however, from previous discussion that certain amounts of assigned time can be expected to be lost to nonprimary duty. We have determined already that each person should have 139 man-hours to devote to his or her primary duty, if there are no extenuating circumstances in this work center. First, three levels are assigned and they require extra training and supervision time. Of these, two 5 levels are assigned and are on OJT to the 7 level. The productive available time spent in this area of OJT and supervision is difficult to determine. But we do know this, that OJT and supervision will take time away from the available productive time and therefore lower the work center's man-hour utilization rate. If the training involved were formal classroom training required by the unit for work on unique equipment, the training time could then be determined and subtracted from the man-hours available for productive labor.

Now, second, multiply 139 man-hours by 9 people; this gives us 1251 man-hours available for productive labor. Referring to the man-hour utilization report, we find that 809.8 man-hours were expended in direct labor by the general-purpose work center. The utilization rate then would be $\frac{809.8}{1251.0} \times 100 - 64.7$ percent. This means that the work center documented 64.7 percent of the man-hours that are available for maintenance.

Exercises (220):

1. Define the following terms:
   a. Relief days.
   b. Most common workweek for vehicle maintenance personnel.

c. Man-hour utilization rate.

2. Using the following data, determine the utilization rate:

   Personnel assigned—5 people.

   Normal workday—8 hours.

   Documented hours—615 hours.

221. Identify two situations which indicate a utilization rate is too low as well as the reasons for unexpectedly low such rates and evaluate a work center's utilization rate.

Interpreting the Utilization Rate. The question should now arise, does the utilization rate computed here indicate that there is a problem in the work center? To answer this question, look into those hours which were available and were not documented in the VIMS. 1251 − 809.8 = 441.2 hours. First, it is necessary to see that these 441.2 hours represent the productive available time of about three people. If five people are in training status—three to the 5 level and two to the 7 level—it is quite conceivable that 441.2 man-hours, or 35.3 percent of the available time, could have been taken up by training needs. Other possible explanations could be that there were highly irregular fluctuations from the averages that were used in determining the man-hour cost factor data (i.e., excessive leaves or passes, sickness, or squadron duties). Also, personnel could be in a TDY status. These factors should be annotated in the Remarks column of the master roster, but that isn't always done. All of the reasons given are plausible explanations for having a lower utilization rate than would be expected and would require that little or no action be taken to correct problems as long as the unit is satisfactorily meeting its mission. These may not be the real reasons though. Other possible causes for low utilization may be: (1) not enough work to keep the assigned personnel busy and (2) poor shop management of resources (occurring when equipment is not being maintained in spite of the low man-hour utilization rate).

Of course there may be many other peculiar reasons for having seemingly low man-hour utilization. But to return to the original question, "What constitutes a low utilization rate?" Well, a subjective answer to this considers two possibilities. First, any time that a reasonable explanation for unused hours cannot be found, or second, no matter what the explanation, if the equipment is not being maintained and the utilization rate is numerically low, there is reason to believe that the rate is too low for comfort. Control charts may be used to help indicate the point at which a utilization rate is going too low.

There is another situation to watch concerning utilization rates for work centers. This situation occurs when the utilization rate is much higher than you would expect. Often this occurs when the unit or command levies a particular goal for utilization. To meet this goal, work center supervisors may falsify documents and produce a higher man-hour utilization than is actually occurring.

Exercises (221):

1. Generally speaking, what two situations indicate that a utilization rate is lower than it should be?

2. Give four of the five reasons that could account for utilization rates being lower than might be expected.

3. For a hypothetical work center, determine the utilization rate, and considering the extenuating circumstances of this particular shop, evaluate the utilization rate:

   a. Work center—Special-purpose shop.
   b. Men assigned—10 men.
   c. Normal workday—8 hrs/day.
   d. No one on training.
   e. One person TDY entire month.
   f. No traveling required.
   g. Direct man-hours reported—360 man-hours.

222. Name the listing(s) used to monitor use of vehicles and state which items will be monitored to insure utilization goals are met.

Vehicle Utilization. This indicator may be used to identify problems dealing with vehicle rotation, excess vehicles, incorrect vehicle assignments, and fuel control procedures. Keep in mind that major command or local commanders may impose utilization standards for vehicles.

You will be called upon quite often to make a list of all vehicles you feel should be rotated, because they are either high mileage or are not receiving enough utilization. The Security Police vehicles and Motor Pool taxies usually receive heavy use. These vehicles may average 5,000 or 6,000 miles a month, while a flight-line vehicle of like design may travel only 50 or 60 miles in a month. To insure that both high- and low-mileage vehicles reach maximum miles and age at the same time, we must change or swap between organizations periodically, so that all vehicles get equal usage. Often this means bringing both vehicles being rotated into the shop so that specially installed equipment can be exchanged, such as radios, emergency lights, etc. Work closely with the Motor Pool on vehicle utilization, because this is very important to the mission of the base.

Using the Vehicle Management Report (PCN N310032), monitor, by organization, the number of vehicles not meeting established utilization. Some of the areas to monitor are:

a. Vehicles receiving fuel but reporting low miles/hours, or reporting high miles/hours and low fuel consumption.

b. High oil consumption.

c. Utilization compared with the standard or goal.

d. High VOC hours by organization code.

If problems are suspected or identified, use a maintenance referral letter to correct the situation and report findings to the vehicle operations officer. Vehicle utilization should be part of your monthly briefing. You can plot utilization on a control chart by organization, vehicle DOD code group, or management code.

Exercises (222):

1. What listing is used to monitor vehicle utilization?

2. Name four areas which should be monitored for possible utilization problems.

3. To whom would you report utilization problems?

223. Name the source reports for analyzing vehicle replacement codes and state which areas may influence replacement codes.

Vehicle Replacement Code Status. Vehicle replacement codes are used to give an overall view of the condition of each vehicle and, thus, the vehicle fleet. The Air Force must program monies far in advance for replacement of equipment and must have an accurate system of programming for worn out equipment and for new or redesigned equipment to meet future needs. In some cases we use vehicles directly from the commercial assembly line, but quite often we must design the vehicle for a specific job. It is your job to insure that your vehicle fleet has the correct codes entered into the VIM system for replacement. If you have errors in your master records which cause the replacement codes to update incorrectly, you may find yourself with an aging fleet of vehicles and no replacements programmed, or with replacement vehicles coming in but of the wrong type and design. TO 00-25-249, *Maximum Repair Allowances, Replacement Codes, and Priority Buy Program for USAF Vehicles*, covers replacement criteria. The replacement codes can be charted by total fleet, management code, or vehicle category. Local commanders may want to monitor specific vehicles or vehicle groups that have an impact on the base mission. Whatever breakdown of the fleet you use, be sure that it is accurate. Replacement code status can also have an impact on vehicle rotation. You wouldn't want an 8-year-old vehicle to show low miles/hours and to be assigned as an emergency vehicle when it is due for replacement and may not stand up to the heavy usage.

You can monitor the replacement codes by using the Vehicle Master List (PCN N310023 and 24) and the REMS report. Here are a few items you should monitor, if you are to have an effective replacement program.

a. The number of vehicles that fall into categories identified by replacement code A through M, N through Q, and R through U.

b. The impact of code A through M vehicles on cost, VOC rates, and direct labor.

c. Any vehicles that consume or accumulate a totally unacceptable portion of costs, VOC, and man-hours, including isolation of these vehicles.

d. A comparison of operating cost with the leasing cost of a like vehicle, if the vehicle were to be scrapped.

e. Replacement codes by percent of fleet.

Using the Vehicle Management Report, monitor replacement codes for those vehicles within a management code that cause excessive VOC, cost, or man-hour consumption. Report your findings to the VMO/superintendent, and inform the operations officer and REMS monitor of any problems you anticipate in vehicle replacement.

Exercises (223):

1. Which list and report contain replacement code information?

2. Which report is used to monitor replacement codes on a quarterly basis?

3. What is the purpose of having a vehicle replacement code?

4. What publication covers vehicle replacement code usage?

5. Name five areas that you must monitor to insure that you have a proper replacement program for vehicles.

4-2. Develop Local Standards

Trend analysis is the evaluation of past numerical data to identify gradual or recurring trends that have developed. Since it deals with "measured-in-time" increments (days, months, years, etc.), trend analysis is often called *time*

series analysis. The basic purpose of trend analysis is to determine whether the overall trend is an increasing, decreasing, or a nonchanging one, and whether any particular month or period is consistently high or low.

224. Name the two methods of plotting trend lines and compute plot points to fit a trend line to selected data.

Freehand Method. This method is the fastest and easiest way of fitting a trend line to plotted data. Its biggest disadvantage is that you need a considerable amount of practice to get the best "line of fit."

To fit a trend line by the freehand method, draw the line through your plotted data so that it indicates the direction the data is following. You can use a transparent straight edge to fit a linear trend line. However, you want to make sure that you have as much of the data above the trend line as you have below the trend line. This is true with both linear and nonlinear trend lines.

Semiaverage Method. In previous discussions you have found that an average is a representative of a series of numbers. If a time series is broken in half, then the two equal parts are represented by the means of both halves. Now plot the two means in the center of the series they represent. A straight line passing through the two means can be considered a rough description of the total trend growth. This type of trend line is called a *semiaverage trend line*.

When dividing a time series that has an odd number of months, the middle month may be added to each half or omitted from the computations altogether. Never use the beginning and ending months as a trend plot point as these 2 months are not considered as the average month in a series.

Exercises (224):

1. Name two methods of plotting a trend line?

2. Using the semiaverage method, what months will you plot if your data series are January through October?

3. Using the semiaverage method to compute a trend line for January through November:

   a. On what month will you divide your data?

   b. On what months will you plot your average?

225. State the use and computation of the "moving average method" for plotting nonlinear trends.

The Moving Average Method. This is a good method for fitting a trend line and may also be used for smoothing out any variations in your data. To iron out fluctuations with *moving averages* means to move their influence. Thus, the moving average can be used for any part of time series analysis. In general, this method consists of taking the arithmetic mean of a given number of values within a time span and making it the center value of the time span used. For example, consider Jan 18, Feb 20, Mar 17, Jun 21, etc. Average the first three values. This will give you 18.3, the value to be plotted next to Feb. Next, you would drop Jan and add Apr to move the average to 19.3. This value is plotted for March. Repeat this procedure until all of the values in the time span are exhausted.

There are three disadvantages of the moving average method.

(1) Data at each end of the overall series is lost.

(2) There is no way to determine the exact position of the trend line value for the most recent time period.

(3) The arithmetic mean is greatly affected by extreme values, causing the moving average to be pulled out of line by unusual events.

Exercises (225):

1. How is the moving average trend line developed?

2. At which point in the time span is the moving average plotted?

3. Determine 3 months' moving averages for the following values: 10, 12, 14, 13, 6, 14, 22, 9, and 17.

4. Why is the moving average method used for plotting nonlinear trends?

226. Given the necessary data, compute the standard deviation and arrive at the upper and lower control limit for the performance indicator.

Standard Deviation. The "standard deviation" is used to establish the upper and lower control limits for local, as well as command performance indicators. To simplify our discussion here, we will discuss only the performance indicator VDM. Remember, this procedure is standard for all performance indicators. The formula for computing the standard deviation is:

$$S = \frac{M(\sum X2) - (\sum X)2}{M}$$

Where: M = The number of months of data
X = A single monthly value
S = Standard deviation

NOTE: The symbol $\sum$ is a summation operation; or in this case, it means "the sum of."

Now, to establish the standard deviation, we need to know what the VDM percentage was for a given period. For the purpose of this example, we will establish VDM percentages for a 6-month period as follows:

Jan 5.0	Apr 4.8
Feb 5.0	May 4.2
Mar 4.5	Jun 5.0

The method used here to solve for standard deviation is one way information can be listed, but it should not be considered the only way. However, it is important to remember that the formula will not change, whatever the method used.

When looking at the formula, you will see that we will, first, need to know what the sum of all X values equals. Second, we need to know the sum of all X values. To do this, list X values in one column and X2 values in another. After this is done, third, find the sum of each column.

		X	X2
Jan		5.0	25.0
Feb		5.0	25.0
Mar		4.5	20.2
Apr		4.8	23.0
May		4.2	17.6
Jun		5.0	25.0
	Sum	28.5	135.8

After this is accomplished, fourth, insert these values in the formula and solve for standard deviation.

$$S = \frac{M(135.8) - (28.5)^2}{M}$$

$$S = \frac{6(135.8) - 812.25}{M}$$

$$S = \frac{814.8 - 812.25}{M}$$

$$S = \frac{2.55}{6}$$

$$S = \frac{1.59678}{6}$$

$$S = .266$$

$$S = .3$$

Now we know that our standard deviation is .3. How do we use this to establish our upper and lower control limit for this performance indicator? The answer is simpler than most people think. First, we must find the "mean" for the indicator. This mean is derived by simply averaging the data for a specified period. In our example 6-month period, the mean would be 4.8 percent VDM. The formula for arriving at the mean is prescribed in AFM 77-310, Vol. 3.

Second, to arrive at the upper control limit (sum), add two times the standard deviation to the mean. In our example, the upper control limit would be 5.4 percent. Third, the lower control limit would be two times the standard deviation subtracted from the mean. Again, using our example, the lower control limit would be 4.2 percent.

Exercises (226):

1. Using the following monthly VDM percentages, compute the standard deviation for this indicator.

Jan	6.2	Jul	4.8
Feb	5.4	Aug	5.0
Mar	5.2	Sep	5.1
Apr	6.0	Oct	6.1
May	5.8	Nov	5.3
Jun	5.7	Dec	4.9

2. Using the data in problem 1, compute the "mean" and the upper and lower control limits.

CHAPTER 5

Visual Media

A CHINESE PROVERB states that one picture is worth a thousand words. This proverb is worded as a statement of fact. However, personnel who are acquainted with the preparation and use of pictures, (or charts, in your case) are sure to find fault with the statement.

Perhaps the statement should read: One picture may be worth a thousand words. Not all charts or pictures get the message across to the viewer. The effectiveness of a table, chart, or graph depends upon the methods used in the preparation of the graphic presentation, its purpose, and how well it covers the subject for which it was intended. This section will show you some techniques which, if applied, will change the expression "may be worth a thousand words," to "is worth a thousand words."

5-1. Tables

A *table* is a mass of data which is sorted, counted, and arranged systematically into rows and columns. The actual arrangement of the data in columns and rows depends upon the purpose of the table. All data appearing on a table should have clear captions, so that supplementary explanations are not absolutely required.

227. Differentiate between general-purpose and special-purpose tables and give one source for a special-purpose table.

The purpose of a table is to show numerical relationships among a series of related areas. There are many types and styles of tables used, but most of them can be classified into two categories: general purpose and special purpose. You need to know the difference between these categories.

General-Purpose Table. A general-purpose table is a table used to record a broad scope of data, usually reference material. For instance, an Air Force command might prepare a table covering the status of nonappropriated funds at all of its installations. The table would be general purpose in that it would be broad in scope and would constitute a source from which special studies and analysis might be made. The general-purpose table is not used for presentations but as a source material for other studies.

Special-Purpose Table. A special purpose table, on the other hand, is—as the name implies—a method of highlighting a particular portion of an analysis. The data for the special-purpose table may be drawn either partially or entirely from a general-purpose table.

Exercises (227):

1. What is the major difference between a general-purpose table and a special-purpose table?

2. Data for a special-purpose table may be drawn from what source?

228. Given a table that contains errors in construction, identify those sections which have not been properly constructed and correct the errors by constructing another table.

A table contains several sections with which you need be concerned. These are:

- Title and/or subtitle.
- Item arrangement.
- Source.
- Preparing agency.

Title. The title of a table should be centered at the top of the table and is usually given in capital letters. It is not erroneous, however, to capitalize the letters of important words, leaving such words as articles, preposition, etc., in lowercase letters. If a subtitle is necessary, it should be centered immediately below the title and appear in slightly smaller letters. All titles should be clear and concise, naming the subject under consideration and where and when the data applies. Under no circumstances, however, should clarity be sacrificed for brevity. It is better to use a long title than to leave doubt about the subject of a table. A title that is too short may be susceptible to more than one interpretation. If more than one line is required, each line should be centered and should contain a specific thought, if possible.

Item Arrangement. Item arrangement is always important. The purpose of any presentation is to present the data contained therein in a clear manner. To do this, you must arrange the data so that the emphasis will be placed on the strategic items in the table. Several methods of arrangement are alphabetical, numerical, geographical, and chronological. As a general rule, the data presented in the

upper left portion receives the most emphasis, with the least emphasis being on the material presented in the lower right portion of the table.

Stubs and Captions. Stubs are placed at the left of the rows, and captions are placed at the top of the columns to identify the data contained therein. These items should be clear and complete enough to prevent misinterpretation of meaning. If this is impossible to do in the space provided, use a footnote to clarify the situation.

Lines. Where lines are to appear between columns and rows, we suggest using double or heavy lines to distinguish between main sections. Subdivisions then can be separated by single or lighter lines. If ruled lines are not used in the table, then use different width spaces for this purpose. This system is used quite often when the table is typewritten.

Footnotes. As the name implies, footnotes are notations made at the bottom of a table to clarify important points. They may be used to clarify or qualify statistical data and explanations. We cannot emphasize too strongly that whenever data may be misinterpreted, you should use footnotes for explanations, if revision of the graphic fail to make the meaning clear.

Tables are usually accompanied by textual or narrative briefings. Nevertheless a table should be self-explanatory. It should always contain a reference to the source of the material used in its preparation, as well as the name of the agency responsible for its preparation. Even though a reference adds nothing to the factual data in the table, you should include it in some inconspicuous place, usually at the bottom of the table. The reason should be apparent. Personnel who deal with the finished product may often use the study for a project of their own or perhaps, in spite of careful preparation, some point may need clarification. If this is the case, often it is desirable to refer to the original source or to the preparing agency for further information or clarification.

In the Air Force, totals generally are presented at the top and left of tabulated data. (This position is in contrast to commercial tables, where totals are placed at the bottom and to the right of the data.) The reason that the Air Force presents totals at the top and left is that the totals are usually the parts of the table that should be emphasized. Remember, information to the top and to the left receive the most emphasis.

Exercises (228):

1. Identify the component parts of the table in figure 5-1 that are not properly constructed.

2. Correct the errors of construction in figure 5-1 by constructing another table.

5-2. Charts and Graphs

Often, charts and graphs are lumped together and called *graphic presentation*. Upon assembling and analyzing a mass of raw data, you will find a wide use for graphic presentation. In fact, it is not exaggeration to say that there are almost limitless possibilities, depending upon your imagination.

It is imperative that data on charts or graphs be accurate, timely, and clearly presented. Charts are great assets as aids in arriving at conclusions; however, they should not take the place of careful analysis. They should be the means to serve as ends, facilitating the solving of a problem, rather than an end in themselves.

229. Identify the components of a graph or chart and when a legend is essential.

Components. Basically, the characteristics of a good chart or graph are the same as those of a good table. Care should be taken to adhere to the governing rules for the title, stubs and captions, footnotes, source, prepared by section, and item arrangement. In addition, a legend is often desired, or is even in a component of a chart, and is necessary for identifying the chart's various colored or shaded items.

Legend. The "legend" is extremely important in the identification of plotted data. It is essential when more than one quantity is presented on a chart. For example, when a line chart presenting the trend of total installation costs is broken down by types of expenditures, there would be separate lines broken down by types of expenditures, trend of total costs, payrolls, and miscellaneous costs. Each different line must be identified by means of the legend.

Stub and captions. Sometimes these can be just as effective as information on the chart itself. One major command devised a method of placing statistical data in the stub, which normally would be placed in an accompanying chart. In addition, an illustration was placed within the chart as an eyecatcher. As a result, this chart became a method of visual expression, causing the reader to stop and examine the chart more closely than might ordinarily be expected. This is merely one example of chart construction variation that resulted from initiative on the part of the statistician.

Exercises (229):

1. State seven components of a chart or graph.

2. When is a legend essential on a chart?

230. Given the necessary information, construct an appropriate bar chart, and state why particular care is necessary when using pictorial bar charts.

Bar Chart. The "bar chart" is the chart probably most easily adapted to show comparisons by size. As the name implies, the data is represented by *bars* or *columns*. Figure 5-2 is an example of one arrangement of the bar chart. The arrangement of the bars may vary in accordance with the

Table of Malfunctions

Carburetors

Month	VEHICLE TYPE			
	GEN. PUR.	SPEC. PUR.	MAT. HLD.	BAS. MAINT.
Jan	2	1	4	7
Feb	0	1	4	2
Mar	2	2	8	3
Apr	0	2	4	4
May	1	15 Safety Inspection	2	9
Jun	3	1	7	11
Jul	9	1	4	7
Aug	2	1	0	4
Sep	3	2	1	5
Oct	0	0	2	6
Nov	1	4	3	1
Dec	1	8	1	2
Jan	3	6	0	5
Feb	4	2	1	7
Mar	9	1	2	2
Apr	6	5	1	1
	46	52	44	76

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Figure 5–1. Objective 228, exercises 1 and 2.

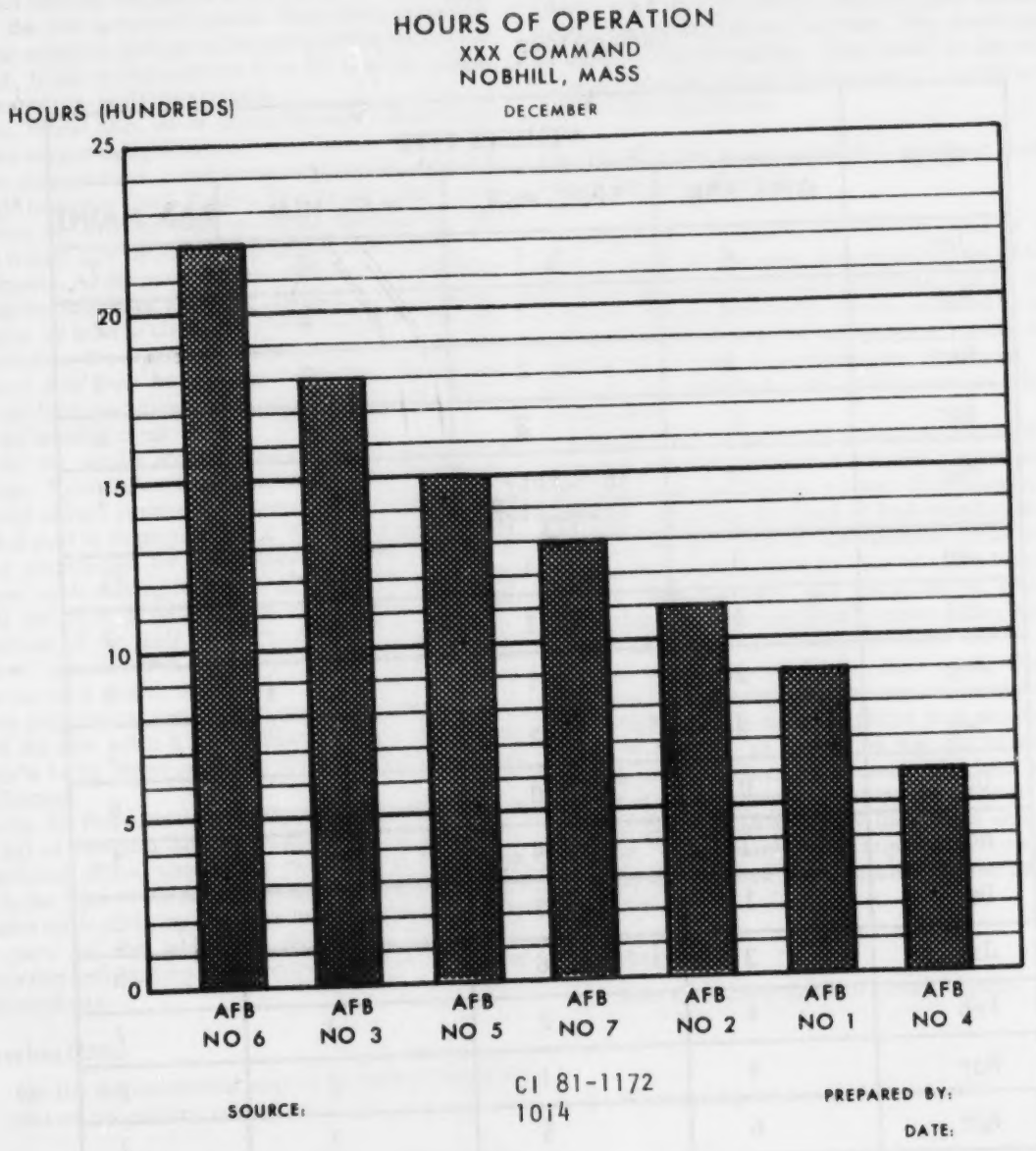

Figure 5–2. Well-constructed bar chart.

impression the analyst wishes to make. The conventional arrangement is to have bars extend or grow from the base line at the bottom of the chart. This arrangement is called the *vertical bar chart*.

Frequently, in charts that show distance, a horizontal bar is used. In this type, the bars extend horizontally across the chart from a baseline either on the left or right side. In such a case, the scale of values will be arranged along the lower border or upper border. The upper location is preferable. It is generally undesirable to have the bars drop from the top of the chart. Sometimes a split bar is used when it is desirable to compare two portions of the same item in a combination which also compares several other items. On other occasions, each bar may be subdivided into segments, each segment representing a fractional value of the entire bar. Such segments may be set off by the use of colors, heavy or light lines, or crosshatching. Actually, the ways of arranging and treating the columns in a bar chart are almost without limit. The principal guide is simplicity. Remember, the more you put on a chart, the less effective it becomes.

The general appearance of a chart is important. An interestingly prepared chart will attract and hold attention, whereas a poorly prepared one may be read with indifference. If you will pay close attention to the rules and principles of construction, you will have an interesting chart.

Figure 5-3 illustrates a poorly constructed bar chart. Some of the obvious errors are errors of omission. The title is inadequate and is susceptible to more than one interpretation. The bars are arranged without regard to size, thereby making any direct comparison difficult, if not impossible. The horizontal lines are not properly identified, and they show through the bars. The scale does not start at zero, making it impossible to obtain a valid comparison of the heights of the bars. The authenticity of the data presented is open to question, because the source is not indicated. It is impossible to tell who prepared the chart, when it was prepared, or the period of time the data represents. The tallest bar does not nearly reach to the top of the chart, which results in poor artistic balance and makes it impossible to visualize the true perspective of the comparative values.

Figure 5-2 illustrates a well-constructed bar chart of the same data shown in figure 5-3. The title tells what, where, and when. The scale is properly identified. The lettering is clear and in horizontal plane; it is not necessary to turn the page sideways to read the titles of the items. The bars have been arranged in descending order of magnitude, thereby facilitating rapid, direct visual comparison between the several bases. All descriptive matter on this chart, except scale headings and the source data, has been centered. This makes the chart neat and attractive in appearance. The scale lines do not show through the bars, but every fifth line is darker to facilitate the reading of bar values.

An important consideration in bar charts is the spacing between the bars. Generally, the space should not be less than half a bar width and no more than one bar width. All bars should be of the same width; it is difficult to read a chart that has a tall, narrow bar beside a short, broad bar.

The arrangement of the bars requires careful consideration. The arrangement may be geographical,

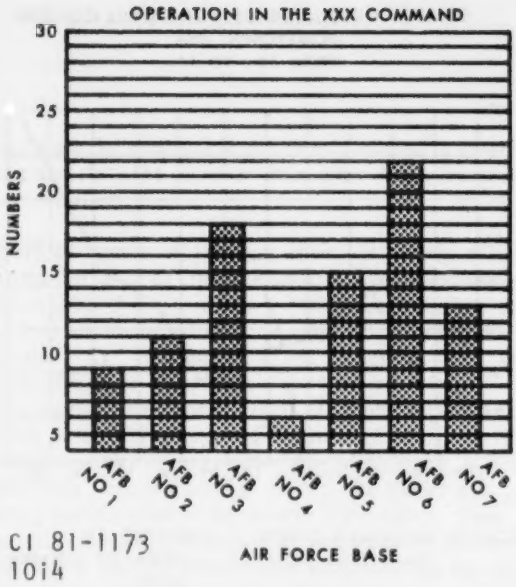

Figure 5–3. Poorly constructed bar chart.

alphabetical, chronological, in ascending or descending order of magnitude, by order of natural interest, by order or emphasis desired, or by some customary classification (such as men, women, and children). The arrangement in a chart is more critical than the arrangement of a table. The comparison or contract desired is more important in most cases than other considerations, with balance and appearance close seconds. Some arrangement by magnitude is usually preferable.

In some instances, the columns or bars may represent the subject of the chart. For example, in presenting data on tons of bombs dropped, the bars may consist of sketches or photographs of bombs placed in vertical or horizontal arrangements. Each bomb should represent a specific number of tons. If additional data were required, it could be inserted directly underneath each row of bombs or it could be placed in a stub.

Where sketches or photographs are used to represent the bars in a bar chart, care must be taken to observe the principles relating to comparisons by means of lines, areas, or volumes. Comparison by lines or heights of columns is preferred, because the human eye is adept at measuring objects of this type. Comparison by areas, however, is tricky. If an object 2 inches square is compared to an object 3 inches square, the areas compared are 4 square inches to 9 square inches. The relationship between 2 and 3 is not the same as the relationship between 4 and 9. This method is unsatisfactory for comparison of simple quantities.

Comparisons by volumes are unsatisfactory for the same reason. A cube 2 inches on each side contains 8 cubic inches, whereas a cube 3 inches on each side contains 27 cubic inches. A faulty comparison results, because the eye does not readily discern the difference between the actual volumes of the two cubes.

Many variations and combinations of bar charts can be made. Tables may be included to explain some of the

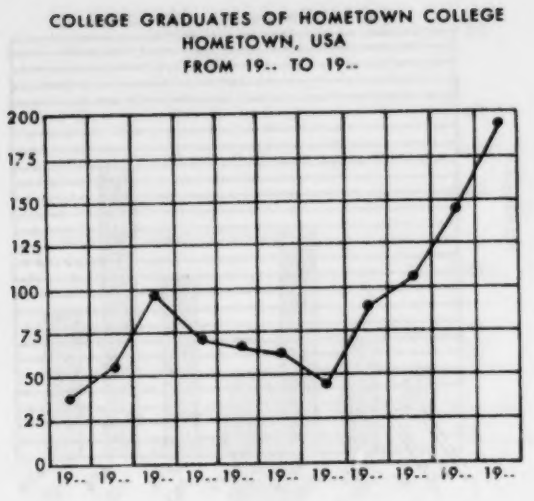

Figure 5–4. Broken curve chart.

charted information. The bars may be subdivided to show portions of the whole. The bars may slide above and below a given value to show the percentage above and below that value. Remember, there are almost limitless possibilities, depending upon your imagination.

Exercises (230):

1. Construct an appropriate bar chart to depict the following information: A monthly check of AF Forms 1823 between April and December indicated the following number of errors by shop:

Shop	*No of Erro*
17220	19
17230	16
17231	7
17232	1
17233	9
17234	5
17235	11
17236	14

2. Explain why particular care is necessary when using pictorial bar charts to represent data.

231. Given the necessary information, construct an appropriate line chart, and explain when a step curve chart is effective.

Line Chart. The "line chart" is a simple, effective means of presenting data of events that have occurred over a period of time. Such a time series may be either cumulative or noncumulative in character. A line chart may also show more than one variable as well as an average or desired rate line.

A line chart is sometimes called a *historical curve*, because of its unique capability for describing data over a period of time. Time series show a continuous movement of the variable and create a more accurate impression in a line curve. A bar chart has a definite break between each bar, as compared with the line chart, which runs continuously from point to point with no breaks at all. Since the eye can follow a line naturally and easily from one point to the next, the line creates the desired impression of a movement of data through time and also shows the magnitude depicted on the chart.

Line charts may be classified as either *broken curve* or *step curve charts*. Figures 5-4 and 5-5, respectively, illustrate the same data presented by these two types of charts.

Broken curve. The points of the broken curve in figure 5-4 represent quantities for each year and are connected by straight lines. This data is noncumulative, or *point data*, which means that the values plotted for each year represent only the total for that individual year or for that point in time.

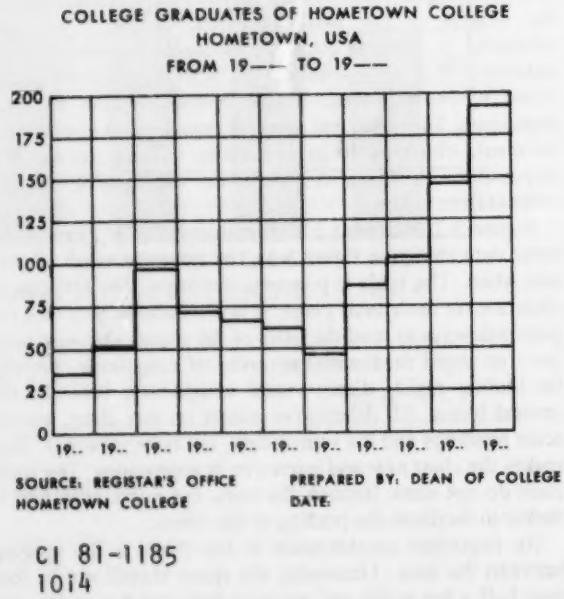

Figure 5–5. Step curve chart.

When reading a chart of this type, you must keep in mind the fact that the lines between plotted points serve only as a means of connecting the points. They establish the direction in which the data are moving and have no value other than that. The curve, or line, serves only to help carry the eye from point to point, thus creating the impression of movement through time.

Step curve. A "step curve chart" (fig. 5-5) is limited in use. If changes are known to be abrupt, a step curve is an effective means of presentation. The disadvantage of a step curve is that the trend, or feeling of movement of the data through time, is lacking. Even more objectionable is the fact that when two or more series are plotted on the same chart and the lines happen to cross or to fall on the same vertical or horizontal grid line, confusion results, and effectiveness is lost.

Line charts showing more than one variable are effective in showing data on similar subjects. A word of caution, however, be sure that you don't overcrowd the chart just to compare similar data. It is better to make two or more charts than it is to overcrowd one chart.

Before we leave the subject of line charts, some information about the selection of scales is necessary. The general rules discussed earlier apply to line charts; however, we have not discussed the spacing to be used for items across the bottom of the chart. In line charts, this spacing is of great importance. Generally, if the chart is divided into squares, the proportions achieved will be satisfactory. That is, the distance from the zero on the scale to the horizontal line for the first major value should be the same as the distance from the zero to the first vertical line representing a month or other item to be charted.

It is possible, by a clever manipulation of the ratio of the scale distance to the item distance, to make data which fluctuates widely appear to be almost smooth. Conversely, data which is smooth can be made to appear to fluctuate more sharply. You must be on guard against distorting the facts by a poor choice of distances on your line charts.

Exercises (231):

1. From the following information, construct an appropriate line chart. Over the past year the following number of cannibalizations have been authorized for a specific management code C285 (special-purpose vehicle).

Month	*No. of Cannibalizations*
Jan	4
Feb	2
Mar	3
Apr	4
May	5
Jun	3
Jul	4
Aug	6
Sep	5
Oct	3
Nov	6
Dec	7

2. When is a step curve chart effective?

232. Name the charts that are closely related to a surface chart and state the peculiar principles of construction of a surface chart.

Surface Chart. A "surface chart" is closely allied to both the *bar* chart and the *line* chart. It combines features of both. Figure 5-6 illustrates a 100-percent surface chart based on a scale of values in percent. The subdivisions are indicated by crosshatching or coloring the areas representing each component of the total data.

In a surface chart, the largest item should be placed at the bottom with the other items arranged above it in a descending order or magnitude. This will balance the chart. If the large item is placed at the top, the reader will get a feeling that the chart is top heavy. If the data contains one item that is quite erratic, the arrangement should be modified so that the erratic item appears at the top of the chart. If this is not done, items that are fairly constant in character will be made to appear to fluctuate as much as the item which really is erratic.

Exercises (232):

1. A surface chart is closely related to which charts?

2. What peculiarity of construction is involved when a surface chart has one item of data which is extremely erratic?

233. Given necessary information, construct an appropriate pie chart and explain why certain types of comparisons should not be made with pie charts.

Pie Chart. The "pie chart" is an excellent method of presentation, although it has some limitations. It is a popular method and, in its own field, it is fully as effective as the bar or line chart. If you want to compare the parts of a whole to the whole, the pie chart is an effective medium. If you wish to compare the parts of a whole with each other, a pie chart is equally effective.

You must be on guard constantly against making charts that are difficult to interpret at a glace. Two- and three-dimensional comparisons are difficult for the human eye to comprehend. For this reason, comparisons of sizes by means of circles (pie charts) is undesirable. Comparisons of sizes are best made by means of bar charts.

Figure 5-7 illustrates the difficulty of comparing sizes with pie charts. In figure 5-7, a comparison of $500 and $1,000 is made. In the upper half of the figure, the $1,000 circle has a diameter twice the diameter of the $500 circle. Your eye is right; the $1,000 circle has four times the area

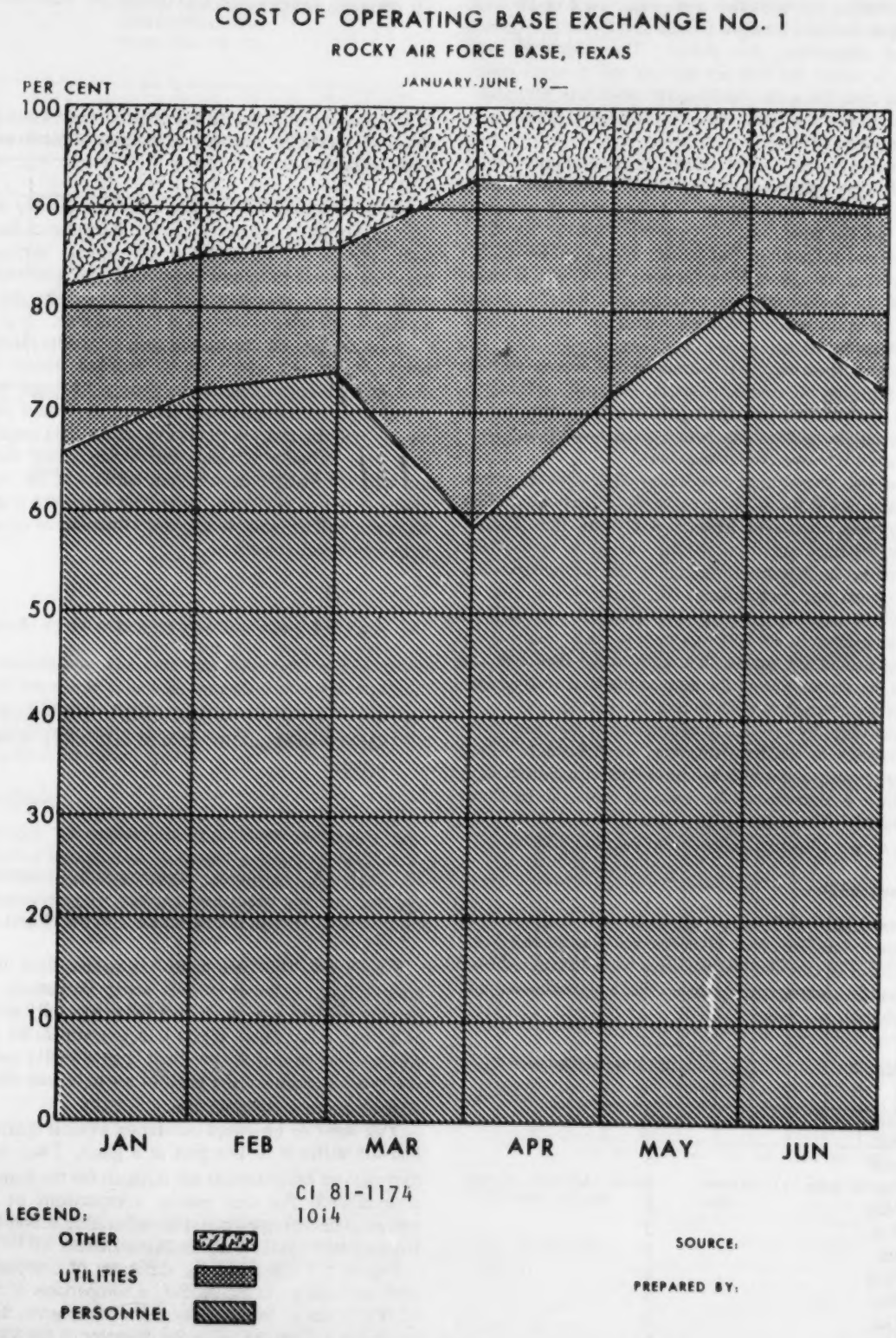

Figure 5–6. 100 percent surface chart.

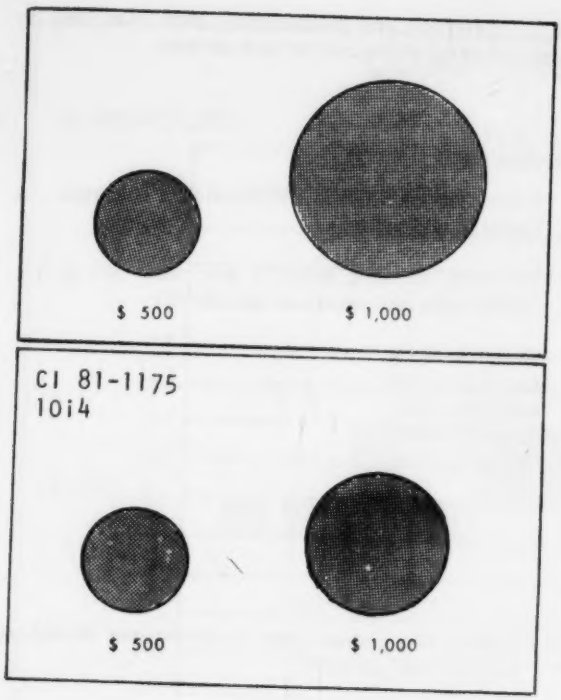

Figure 5–7. Comparison of sizes of pie charts.

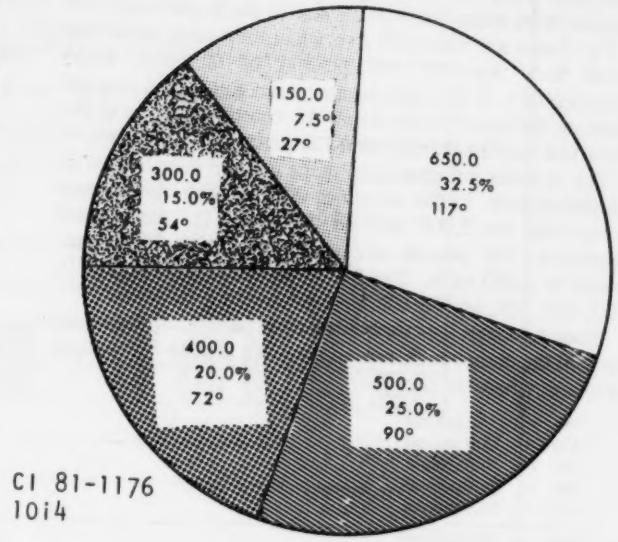

Figure 5–8. Pie chart with segment labeling.

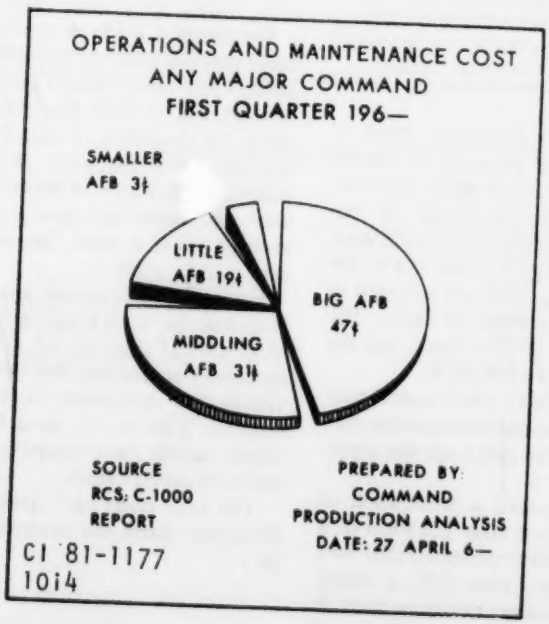

Figure 5–9. Pictorial pie chart.

of the $500 one. In the lower half of figure 5-7, the $1,000 circle has an area twice the area of the $500 circle; but in this case your eye fools you, because the $500 circle appears to be more than half the size of the $1,000 one.

Pie charts are most effective when they stand alone and when they represent 100 percent of the item under consideration. If it is necessary to use more than one pie chart on the same presentation, the charts should be of the same size and should represent 100 percent of the subject.

The manner of presenting a percentage breakdown is illustrated here. In this situation, there are five components comprising the 2,000 units of the total. The circle itself represents 100 percent of the amount being illustrated, which is 2,000 units. The five components represent 150, 300, 400, 500, and 650 units, respectively.

Your first step is to determine what percent of the whole each of the components represents. This is done by a simple division, where we find that:

150 = 7.5 percent
300 = 15.0 percent
400 = 20.0 percent
500 = 25.0 percent
650 = 32.5 percent

2,000 = 100.0 percent

Your second step is to determine how many degrees of the circle will be required to represent each percent we have found. There are 360° in a circle, so 3.6° represents 1 percent. To solve this problem, it is necessary to multiply only each of the percents we have found by 3.6°. We find that:

7.5 X 3.6 = 27°
15.5 X 3.6 = 54°
20.0 X 3.6 = 72°
25.0 X 3.6 = 90°
32.5 X 3.6 = 117°

100.0 percent = 360°

With the aid of a compass and a protractor, third, it becomes a simple matter to lay out the segments of a circle to represent each of the component parts. A radius is drawn from the center of the circle to the point of the circumference where 12 o'clock should be if the circle were the face of a clock. The largest segment is laid out to the right of the radius. The remaining segments are arranged in a clockwise sequence in descending order of value. The largest segment appears to the right of 12 o'clock, and the smallest segment appears to the left of 12 o'clock.

The various segments may be colored, and a legend may be used to identify each element. It is customary, however, to label each segment and to give its value on the chart. This method is illustrated in figure 5-8.

A pie chart is effective in presenting a distribution of costs. This is particularly true when it takes the form of a "pictorial pie chart," showing a silver dollar divided into the various elements of costs. In figure 5-9, a major command reported the operations and maintenance costs of four air bases in terms of 1 dollar. The individual items of 47 cents, 31 cents, 19 cents, and 3 cents total 1 dollar. Likewise, the illustration shows that Big AFB used 47 percent of the total cost of operations and maintenance, while Middling AFB used 31 percent. If we know the total cost of operations and maintenance, then it is easy to compute the total dollar cost for each air base.

Exercises (233):

1. From the following information, construct an appropriate pie chart.

   The total operating hours of four radar sets at five similar units for 1 month are as follows:

   Group A—2550
   Group B—1473
   Group C—1927
   Group D—846
   Group E—2112

2. Explain why certain types of comparisons should not be made with pie charts.

234. State circumstances appropriate for line and bar deviation charts, and given necessary information, construct an appropriate deviation chart.

Deviation Chart. A special variation of some of the other types of charts is sometimes classified as a "deviation chart." For some special purposes, commanders and staff officers like to have data presented in a manner that will show the deviation of data from a zero point or from a normal or average point. Both line and bar charts can be adapted to this type of presentation. When the zero line is used, the values are generally given in percent. When an average value is used, the original units of measurement appear in the scale.

Figure 5-10 illustrates data using a *bar deviation chart.* Note that the stock level for January in figure 5-10 is at the ideal level of stockage, 21 days. The bar deviation chart is especially appropriate for this presentation in that it shows vividly the deviations from the desired stockage. In a situation such as we have here, the bar deviation chart would be the most effective in showing this data over a period of several years.

You must study each situation you wish to present using deviation charts and determine which is the best chart to use.

Exercises (234):

1. Construct the appropriate deviation chart for the following data:

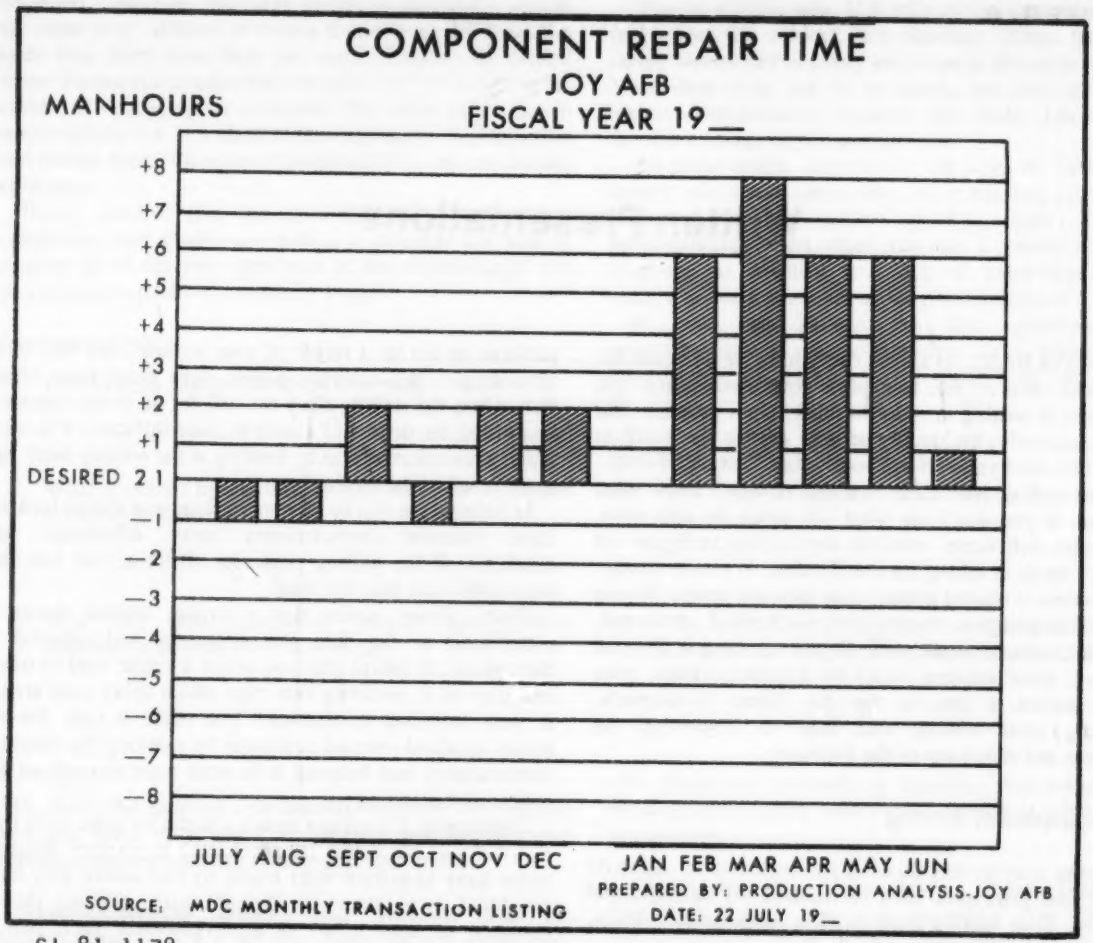

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Figure 5-10. Deviation bar chart.

The chief of transportation at Base A wants to know how his or her unit has fared in the area of NORS rate in comparison with his or her goal of 7.0 percent or less. The NORS rates for this base over the last 6 months are:

Jan	8.1°
Feb	9.2°
Mar	4.6°
Apr	6.2°
May	7.1°
Jun	5.9°

2. Under what circumstances, time-wise, should you use (a) a line deviation chart or (b) a bar deviation chart?

CHAPTER 6

Written Presentations

WRITING IS BASIC to almost everything we do in the Air Force. You must be able to express your ideas, plans, and procedures in writing in order to think, plan, propose, and do. Consequently, the quality of your writing has much to do with how well you perform your duties in the Air Force.

If your writing isn't clear, the reader won't know what you want. If you don't say what you mean the first time, your reader will waste valuable time trying to figure out what you mean or asking for clarification. If you're wordy, valuable time is wasted getting your message across. If your choice of language is unusual, too mechanical, or formal, the reader loses interest. And, if your thinking is illogical or biased, your solution won't be accepted. Thus, poor writing means a loss to the Air Force. Conversely, improving your writing can lead to improving the operations and efficiency of the Air Force.

6-1. Principles of Writing

To make your writing do what you want it to do and to do it well, four principles must be adhered to, carefully and critically. Your writing must be clear, appropriate, direct, and correct.

235. State the relationship that unity, coherence, and emphasis have to clarity.

Clarity (Did You Communicate Clearly?). In terms of clarity of your writing, you should ask yourself the following four questions.

(1) Does your main message come through easily?
(2) Are your ideas logically organized?
(3) Have you supported and developed your ideas?
(4) Have you weeded out unnecessary details?

Clarity has been placed at the beginning here intentionally. It is the most important quality to strive for when writing. The reason is simple. If the meaning is not clear, you have wasted both your time and the readers' time. If the idea does not stand out as clearly on the written page as it did in your mind, you have failed to move that idea, whole and intact, from you, the transmitter, to the receiver. At best, your communication is only partially successful. At worst, you may not only fail to communicate the intended idea, but you may implant one that is false, distorted, or misleading.

It is not always easy to decide whether or not you have expressed your ideas with clarity. If the reader is required to perform an act as a result of your writing, and has acted accordingly, the communication must have been clear. But, when the writing does not call for an overt response, measuring the degree of clarity is more difficult. You must judge your effectiveness by looking at the writing itself, not at the result of the writing.

In judging the clarity of your writing, you should look for three essential characteristics: unity, coherence, and emphasis. If the writing possesses all three, you can feel reasonably sure that it is clear.

Unity. Unity means that a strong, central theme is established in the first few sentences and adhered to throughout. It means that you select a single road to travel and stay on it, avoiding side trips which delay your arrival at your intended destination. You make it easy for the reader to travel without confusion by marking the message unmistakably and keeping it in plain sight throughout the course of the writing.

Coherence. Coherence means that the separate parts read in a natural, easy flow from one idea to another. Readers never have to retrace their tracks to find where they have wandered away from the thought path. Writing that is coherent in total effect is achieved when each part is coherent. The sentence structure needs to follow one of the customary patterns. If it varies, the meaning must remain unmistakably clear. Each paragraph is built according to a logical arrangement and is essential to the plan devised by the writer. Each sentence in the paragraph contributes something to the idea and advances the meaning. Therefore the overall effect is a steady progression of thought along a predetermined route.

Emphasis. Emphasis requires you to sort and weigh your ideas before you write. Some are major ideas. Some are minor. Others are in neither category, and you discard these quickly. In your writing, emphasize the relative importance of your ideas. You can do this in many ways. You can do it boldly and directly by introducing a major idea with a phrase that says, "This is important." You can take advantage of mechanical means by underlining your main ideas, placing them in italics, or using headings and subheadings. All of these devices are helpful.

Emphasis can also be gained by more subtle methods. One of these is *proportion*. If you wish to present two ideas of unequal importance, common sense indicates that more attention should be given to the more important one. Therefore you give the major idea emphasis by devoting more space to it, developing it more fully and supporting it in greater depth and detail. *Repetition* also aids in

emphasis. This does not mean merely repeating the idea in the same way. Rather, it means focusing attention on the same idea from more than one angle. Finally, the skilled writer knows that a major idea should never be buried in the middle of a paragraph or a chapter. The reader looks almost automatically for key ideas at the beginning of a selection and retains them if they are reemphasized in the concluding sentences.

Being mindful that the essentials of clarity—unity, coherence, and emphasis—makes it possible for you to answer all of the four questions at the beginning of this section with a positive, confident "yes."

Exercises (235):

1. How is unity related to clarity in writing?

2. What is meant by the term "coherence" in reference to clarity in writing?

3. How can you emphasize clearly the relative importance of your ideas in writing?

236. State the desired relationship between the subject and the tone of a piece of writing and explain the relationship between the reader and the writer.

Appropriateness (Does The Writing Fit Its Environment?). There are four questions you should ask yourself in terms of the appropriateness of your writing. They are:

(1) Does the general tone suit the subject matter?
(2) Have you considered who your reader will be?
(3) Have you considered his/her knowledge level?
(4) Does your writing style seem to fit you?

Writing, to be appropriate, must fit its environment. This consists of several factors, all of which influence tone and style.

The nature of the subject is the first factor. If the subject is a serious one, the general tone of the writing should match. This does not mean that the writing must be dull. It can still be interesting, although serious. Treating a serious subject in a light and humorous vein could entertain the reader, but you could lose the importance of the subject matter.

Another factor to be considered under "appropriateness" is the reader. The reader is a key factor in deciding the style, level, and tone of the writing.

Although the primary purpose of writing is to express ideas, *the manner in which they are expressed* creates an impression of the writer in the reader's mind. This is why the third factor in the writing environment—the writer—should be considered.

Writing mirrors you. If it reflects the way you sincerely feel about the subject, the message "rings true." The reader senses this sincerity and respects the ideas presented. Your ideas may not be accepted, but they will receive honest consideration, because the reader has formed a favorable image of you as a person.

An unfavorable impression can also be formed. The reader can sense ideas that are presented artifically or insincerely. The reader quickly spots superficial understanding, even when you use a veneer of flowery language to disguise any lack of knowledge. A glib vocabulary will not cover up the inadequacies of a writer.

If you can answer the four questions under appropriateness in the affirmative, your writing fits its environment and is on its way to doing what you want it to do.

Exercises (236):

1. How does the nature of the subject influence the tone of writing?

2. Why is the relationship that forms between the reader and you, as a writer, so important to your purpose in writing?

237. State two methods of insuring directness in your writing and explain why direct writing is advantageous to a reader.

Directness (Do Your Ideas Come Into Focus Quickly?). There are five questions you should ask yourself in terms of directness. These are:

(1) Have you avoided long, involved sentences?
(2) Have you chosen simple words, rather than flowery or unusual ones?
(3) Will the reader understand all technical terms?
(4) Did you use active verbs whenever possible?
(5) Did you use personal pronouns where appropriate?

Directness means writing that can be read easily and comprehended quickly. You can best achieve directness with simple, uncomplicated sentences. You must seek and use words that your readers can grasp effortlessly. You might think that such writing would tend to be cramped and monotonous, but this is not necessarily true. Sentences can be varied in both word arrangement and length for good readability. Word choice need not be limited to a small vocabulary. On the contrary, a large vocabulary enables you to choose exact words to convey exact meanings.

To achieve directness, write as you talk. In other words, write conversationally. When speaking, the average adult presents ideas simply and directly. The listener understands them. Unfortunately, when writing these ideas, adults sometimes fail to express themselves effectively. If your ideas are written as naturally as they are spoken, your writing improves, and the reader's comprehension increases in direct ratio.

If information is written naturally and directly, then you will be able to answer all the questions under the criterion, "directness," with a direct and positive "yes."

Exercises (237):

1. What two methods can you use to help insure directness in your writing?

2. Why is directness in writing advantageous to a reader?

238. State why correctness in writing is important and, given sentences containing errors in English usage, correct these errors.

Correctness (Have You Met the Standards of Accepted Usage?). Ask yourself the following five questions about the correctness of your writing.

(1) Are you sure about your spelling?
(2) Do your subjects and verbs agree?
(3) Have you punctuated correctly and where necessary?
(4) Are your pronouns in the right case?
(5) Have you capitalized correctly?

The final item on the checklist, labeled "Correctness," is probably the one most often used by the reader to form an opinion of a writer. The use of the English language is the standard by which the reader forms opinions of you and decides whether your ideas are worth considering. This is why correctness is so important in English usage. You may word your message clearly, but if the reader decides that it stems from an uneducated source, he or she may decide that your message cannot be important and ignore it.

What is correct usage? Most grammarians say that correctness is determined by the way educated persons use the language. Consequently, the rules are not hardfast and unchanging. However, there are some generally recognized standards that determine correct and incorrect usage. If you develop a knowledge of these standards, you can increase your confidence in language usage and help to insure respect for your ideas.

Rules of language usage are similar to traffic rules. When you learn to drive, the rules are new, and you must think consciously about what you must do to comply with them. For example, when you see a stop sign, you must think about stepping on the brake. Learning to abide by language rules is somewhat similar. The writer with little experience must think about the rule to comply with them. Experience, however, makes compliance almost automatic. Just as the driver gets a "feel for the road" and drives almost effortlessly, so you can acquire a "feel for language" and write easily without having to be conscious about the rules constantly.

The five areas covered by the questions under Correctness do not include all of the rules of correct usage. However, they are the areas in which the most common and obvious errors occur. If you are reasonably confident about your spelling, verb agreement, punctuation, pronoun selection, and capitalization, you probably meet the other standards of correct usage as well. On the other hand, if you have doubts about any of them, you probably have other language usage problems.

Exercises (238):

1. Why is it important for you to write the English language correctly?

2. Replace the incorrect words in the following sentences with the correct words.

   a. Each section were filled out correctly.

   b. The chief of maintenance wanted to talk to we three about the maintenance summary.

   c. Its necessary to receive all afto forms each day.

6-2. Develop Narratives

In preparing a well-written narrative, avoid your personal bias and present only the facts. One of the easiest ways to mislead someone is to use statistics that tell only those parts of the story that benefit your particular cause. This is especially true since you may be the only one present who has all of the data and a good knowledge of the procedures used to compile your study.

239. Specify where in a report you should place specific types of information.

Written Report. There are several formats for preparing a report and most of them are acceptable. However, here we will only cover the format you will be using most often.

The heading. This section of your report will include your office symbol, the name of the individual who prepared the study, and who should be contacted should any questions arise about the contents. Next will be a brief description of the subject matter. Use enough words to be meaningful to the reader. After the subject, put the office symbol and the name of the individual to whom you wish the report to be directed. Also, include the date of the report in the upper right corner.

The body. This is the real meat of your report. The body contains five elements: problem, factors bearing on the problem, discussion, conclusion, and action recommended. We discuss these in the order named.

a. Problem. The statement of the *problem* tells the reader what you are trying to solve. It is often ineffective to state a problem as a fact, such as "Personnel in this maintenance complex fail to observe supply discipline." It may be more effective to state the problem in one of the following ways:

(1) As a *question:* "What should we do to enforce supply discipline in this maintenance complex?"

(2) As an *infinitive phrase:* "To find ways to enforce supply discipline in the maintenance complex."

(3) As a *statement of need or purpose:* "This maintenance complex needs to develop procedures for enforcing supply discipline."

No discussion is necessary at this point. A simple statement of the problem is sufficient. You will have sufficient opportunity to discuss all aspects of the problem later on in the report.

b. Factors bearing on the problem. This section contains the facts, assumptions, criteria, and definitions you used to build possible solutions to your problems. A *fact* is a statement of truth that can be proved. An *assumption* is a statement that may or may not be true, but for the purpose of the problem, must be accepted as the basis for your reasoning. *Criteria* are standards, requirements, or limitations used to test possible solutions. Devote separate paragraphs to facts, assumptions, criteria, and definitions.

Obviously, if you write a report in which you have no *assumptions* or *definitions,* it is permissible to omit either or both. Include only those important factors that you used to solve your problem.

c. Discussion. The *discussion* section of the report shows the logic used in solving the problem. It may be handled in various ways, depending upon the problem being reported. Some type of introduction is desirable. Generally some background information is necessary to properly introduce your problem. The introduction may be only one paragraph, but it could contain several paragraphs, depending on the detail required.

d. Conclusion. Having shown how you reasoned the problem through, state your conclusions. The *conclusion* must provide a complete, workable solution to the problem. The conclusion is nothing more than a brief restatement of the best possible solution or solutions that have been described in detail in the discussion. However, the conclusion should not continue the discussion. It should completely satisfy the requirements of the problem. Never introduce new material in the conclusion.

e. Action recommended. This part tells the reader what *action* should be taken. The recommendations that you make depend upon your position in relation to the person receiving the study and upon the variables of the problem. The number of recommendations is not important, but their validity is!

The ending. The *ending* should be simple. It should contain the signature, grade, title, and organization of the person or persons responsible for the report and the listing of attachments, if applicable.

Attachments. Since the body of your study must be brief, relegate as much of the details as possible to the *attachments*. For example:

a. Failure to include certain directives or instructions may delay the action you recommend. If all necessary directives are included in the attachments, a simple approval will set the machinery into action.

b. The body of the study may make a reference to an authority directing the study. An attachment may state the source and include the material that verifies that statement.

c. When the staff study format is used by analysis personnel, it more than likely contains data based on statistical inferences that can be portrayed graphically. The graphs or charts that display the data that are talked about in the body of the report should be included as attachments.

Exercises (239):

1. The gathered data and associated facts that led you to the solution of your problem should be contained in what section of your report?

2. If you cite a letter of policy in your report, and this statement of policy is essential to your conclusion, where should this letter appear in your report?

3. In which parts of the report can the readers find information that would allow them to contact someone who knows about the origination of the report?

4. Where in the report should you find a step-by-step solution to the problem?

5. When you have fully determined what you consider is the best possible solution to the problem, where should this statement be located?

6. Where should you place a trend chart showing an increase in labor-hours per unit produced?

6-3. Develop Summaries

When your commander picks up a piece of paperwork that comes across the desk, certain questions will come to mind, such as: "What is this?" "Why is it here?" "Where did it come from?" and "What should I do?"

Commanders need background information and details on matters that come to them for action. But they also need to conserve time for the function that is uniquely theirs—decision making. You can meet both of these needs. Whenever you forward a proposed solution to a problem, include a one-page communication that answers the questions mentioned.

This one-page communication is called a *summary* or a *cover brief*. Its format varies according to the individual or situation. Regardless of its format, however, it must be easy to read and understand.

240. Name the characteristics that make up a good summary and, specifying the purpose of one characteristic, indicate where various characteristics are found in reports and summaries.

There are four characteristics that identify a good summary. They are accuracy, brevity, clarity, and transitions. We discuss these in the order named.

Accuracy. Don't slant the material nor omit significant data. For greater accuracy, you can substantiate your summary by using such significant data as support documents and statements that will have a bearing on the decision. These should be included as attachments and referred to in the summary following the statement they support.

Brevity. Since "summary" or "briefing" denote directness and brevity, your summary must get right to the point. Normally, your brief or summary should be no more than one page long. One way to achieve this is to reference in the summary to your attachments as much as possible for material supporting your summary statements. Remember, the person reading your brief doesn't have much time to dig out facts or look for hidden meanings.

Clarity. Here you will be concerned with two kinds of clarity—clarity of material and clarity in its organization. Both involve logic and easy readability. Also, such clarity must be sought for in all sections of your written report, not just the summary we are discussing here.

To obtain clarity of material, you must condense your information into easily understood terms. Its not enough to know your subject. You must also translate your knowledge into the reader's language.

In addition to achieving clarity of material, you must also strive for organizational clarity. How should you do this? Your best guide here is to follow the format of the written report outlined in learning objective 239. When you do this, the reader knows immediately that you have been thorough and logical. You have just made it easy for the reader to make a decision and to solve the problem, instead of creating new problems.

Transition. Show a relationship of ideas by typing them together with good transitions. This practice will allow the reader to progress easily from one idea or through it to the next. Sometimes only one word will do the trick, while at other times you may need to use a phrase, a sentence, or a paragraph. But don't become too elaborate here and confuse or lose your reader; this could do more harm than good to your summary.

Exercises (240):

1. What are the four characteristics that identify a good summary?

2. Referencing in your summary to an attachment to support a statement in that summary is an example of what characteristic?

3. What is the purpose of good transitions?

4. Significant data should be contained in what section of a written report? Under which of the characteristics of a good summary is this discussed?

5. Organization of your material so that it is logical and easy to read relates to what characteristic of the summary, and where should this characteristic be found in your written report?

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TO 00–25–249, *Maximum Repair Allowances, Replacement Codes, and Priority Buy Program for USAF Vehicles*.

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

A&F—Accounting and Finance
AFOLDS—Air Force Online Data System
AFSC—Air Force Specialty Code
AMSDS—Automated Management Supporting Data Systems
BIRF—Batch Information Retrieval Facility
BLIS—Base Level Inquiry System
CC—Card Column
CDC—Career Development Course
COPARS—Contractor Operated Parts Store
DOD—Department of Defense
EDPE—Electronic Data Processing Equipment
EDPS—Electronic Data Processing System
EEIC—Element of Expense Investment Code
MC/A—Maintenance Control/Analysis
M/H/K—Miles/Hours/Kilometers
NSN—National Stock Number
PCAM—Punch Card Accounting Machines
RC/CC—Responsibility Center/Cost Center
REMS—Registered Equipment Management System
TO—Technical Order
VDM—Vehicle Deadlined for Maintenance
VDP—Vehicle Deadlined for Parts
VIMS—Vehicle Intergrated Management System
VMO—Vehicle Maintenance Officer
VOC—Vehicle Out of Commission

Answers for Exercises

CHAPTER 1

Reference:

200 – 1. By relieving you of sorting, filing, and keeping tables on vast amounts of data.

200 – 2. Processing the maintenance data generated under the provisions of AFM 77–310.

200 – 3. The comptroller.

201 – 1. To convert coded information to an electronic language and to enter the data into the data processing machine.

201 – 2.

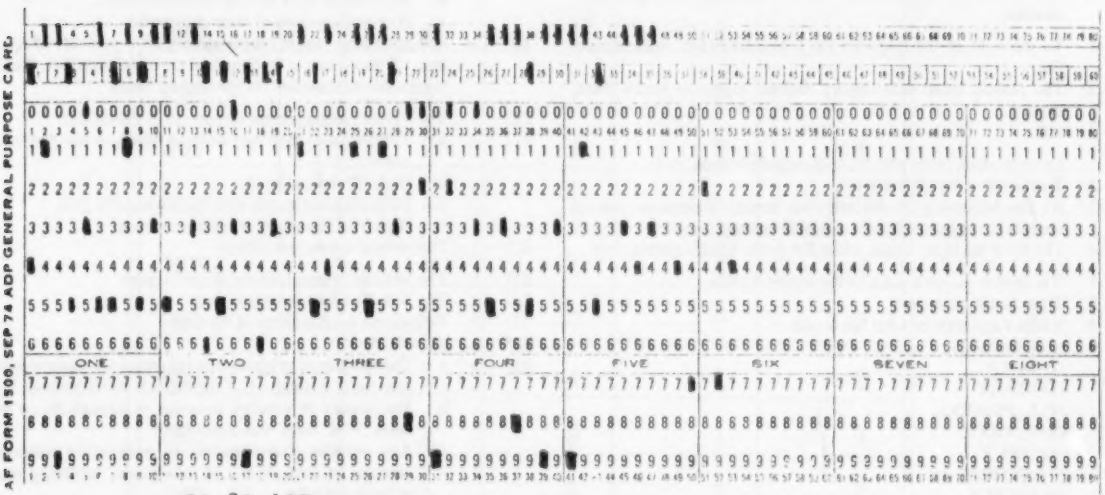

Figure A–1. Answer for objective 201, exercise 2.

202 – 1. Card hopper, punch station, read station, stacker, and keyboard.

202 – 2. The maintenance forms are sorted into stacks. Next, the keypunch operator places the appropriate program card (drum card) on the drum of the keypunch machine. Then the needed information is transcribed from the source documents and the data is verified.

203 – 1. Input, control, memory, arithmetic and logic, and output components.

203 – 2. (1) The input component provides a means for entering original data into the machine.
(2) The control section determines the type, sequence, and directions of the computations.
(3) The memory (storage) component retains information until it is needed.
(4) The arithmetic and logic section does the simple counting.
(5) The output component provides the means of discerning final results.

204 – 1. Configurations A and B.

204 – 2. Level A, for light workloads and level B, for high workloads.

204 – 3. A and D.

CHAPTER 2

205 – 1. The C card.

205 – 2. The B and C cards.

205 – 3. The A card.

205 – 4. $20 or more.

206 – 1. ARADOP.

206 – 2. ARADOF.

206 – 3. AFADOJ.

206 – 4. ARAD1C.

206 – 5. ARADOF.

207 – 1. To build quarterly tapes.

207 – 2. All master files except the quarterly summary.

207 – 3. For site relocation.

207 – 4. To allow for corrections to be processed before quarterly tapes are sent to Warner Robins ALC.

207 – 5. The ARAQ6T.

208 – 1. Scheduled maintenance system codes.

208 – 2. As contract/other government agency cost, labor cost, and materiel cost.

208 – 3. Any vehicle that does not appear on the master list.

209 – 1. To load new employees assigned to the system.
209 – 2. The name, ID number, rank/grade, assigned labor code, hourly labor rate, AFSC, available hours, and work center.

210 – 1. File ARADOJ.
210 – 2. Monthly.
210 – 3. Labor timecards and work orders.

211 – 1. As a quick reference list to check proper work center and labor code assignments.
211 – 2. The low-cost bench stock and indirect labor cost.
211 – 3. By obtaining a civilian annual salary, dividing it by 2,080 hours, and increasing this result by 29 percent or obtaining the military wage rate, adding this to the civilian result, and dividing the total by the total assigned personnel.
211 – 4. Accounting and Finance.

CHAPTER 3

212 – 1. By running a work order historical inquiry for a 3-month period.
212 – 2. By running a work order historical inquiry by registration number.

213 – 1. To show all of the items on the high-cost bench stock master file.
213 – 2. The vehicle static data inquiry and the high-cost bench stock inquiry.
213 – 3. 100.

214 – 1. Execute, data, start, pseudo, end, retrieval cards, end.
214 – 2. To identify a pseudo retrieval.
214 – 3. As the beginning of the retrieval control statements and to identify the organization the retrieval belongs to.
214 – 4. The R1 is the input mode, while RA is the VIMS system code.

215 – 1. It is used to assign a name to the retrieval cards.
215 – 2. Three to six characters.
215 – 3. It tells the computer what file to use.
215 – 4. (1) EXECUTE.
(2) DATA.
(3) START.
(4) R, PSEUDO.
(5) R, TEXT.
(6) INPUT.
(7) OUTPUT.
(8) SELECT.
(9) SORT.
(10) DISPLAY.
(11) END-OF-TEXT.
(12) R, R FUL–CS.
(13) ?END.

216 – 1. To give a temporary name to a DAN.
216 – 2. They must be 1 to 12 characters long and begin with an alpha.
216 – 3. To provide a subtotal or grand total for an alpha field.
216 – 4. To add arithmetic data fields only.
216 – 5. That the break control name must match the names specified in the sort statement and be in the same order.
216 – 6. Set the counter back to zero when the control break name changes.
216 – 7. To specify the format for each detailed line of print.

217 – 1. To give a record count by record groups at controlled breaks.
217 – 2. Subtotals to print at tally breaks.
217 – 3. Six.
217 – 4. The numeric data field.

218 – 1. To assign a temporary name to a data element not listed in the DEN table.
218 – 2. 12 digits.
218 – 3. Three.
218 – 4. TO BE.
218 – 5. A DEFINE statement for every data field you want selected that is not on a DEN table.

CHAPTER 4

219 – 1. Productive (01 and 02), indirect productive (20–23), and indirect nonproductive (41–43, 51–56).
219 – 2. Control charts.
219 – 3. (1) Low skill levels, (2) changes in supervisors, and (3) workload scheduling.
219 – 4. Man-Hour Utilization Report.

220 – 1. a. Saturdays, Sundays, and compensation days for working on these days.
b. 40 hours.
c. Percentage of available direct productive man hours expended in direct labor.
220 – 2. 73.2 (20.99 × 8 × 5 =; divide this into 615 for answer).

221 – 1. First, whenever a reasonable explanation for unused hours cannot be found; and second, when, no matter what the explanation, the equipment is not being maintained and the utilization rate is low.
221 – 2. Your answer should include four of these reasons:
a. Available time spent in training.
b. Irregular fluctuations from the averages used in determining the man-hour cost factor data.
c. TDY.
d. Insuffieient work to keep personnel busy.
e. Poor management of shop resources.
221 – 3. The utilization rate is approximately 28.8 percent, which is too low. With no one in training and no travel required, there is no reasonable explanation for the unused hours.

222 – 1. The Vehicle Management Report (PCN N310032).
222 – 2. a. Vehicles with high fuel and low miles, or low fuel and high miles.
b. High oil consumption.
c. Utilization compared with the standard or goal.
d. High VOC hours by organization code.
222 – 3. The vehicle operations officer.

223 – 1. The Vehicle Master List and REMS report.
223 – 2. The Vehicle Management Report.
223 – 3. To indicate the condition of the fleet.
223 – 4. TO 00–25–249.
223 – 5. a. The number of vehicles that fall into each replacement code (classes A through M, N through O, and R through U).
b. The impact of vehicles in codes A through M on vehicle costs, VOC rates, and direct labor.
c. Any vehicles that consume or accumulate unacceptable portions of cost, VOC, or man-hours, including isolation of those vehicles.
d. A comparison of the operating cost with the leasing cost.
e. Replacement codes by percent of fleet.

224 – 1. The freehand method and the semiaverage method.
224 – 2. March and April.
224 – 3. a. On June.
b. On March and September.

225 – 1. By moving the time span averages through the time series.
225 – 2. At the center of the time span.
225 – 3. 12, 13, 11, 11, 14, 15, 16.
225 – 4. To smooth out variations in data.

226 – 1. 0.466 or .5.
226 – 2. The mean is 5.5; the upper control limit would be 6.5 percent; and the lower control limit would be 4.5 percent.

CHAPTER 5

227 – 1. A general-purpose table is very broad in scope, while a special-purpose table is narrower and highlights a specific part of an analysis.
227 – 2. A general-purpose table.

228 – 1. The table in figure 5-1: (1) does not have a clear title, (2) has a main caption that is not sufficiently precise, (3) does not use a footnote where necessary, (4) has poor item management, (5) does not identify the total with a stub, and (6) omits the source and "prepared by" portion.

228 – 2.

Table of Malfunctions

Carburetors

Jan – Apr

Month	Failures by Vehicle Type			
	Base Maint.	Spec Pur.	Gen Pur.	Mat Hld.
Jan	7	1	2	4
Feb	2	1	0	4
Mar	3	2	2	8
Apr	4	2	0	4
May	9	15[1]	1	2
Jun	11	1	3	7
Jul	7	1	9	4
Aug	4	1	2	0
Sep	5	2	3	1
Oct	6	0	0	2
Nov	1	4	1	3
Dec	2	8	1	1
Jan	5	6	3	0
Feb	7	2	4	1
Mar	2	1	9	2
Apr	1	5	6	1
Total	76	52	46	44

Source: CI 81-1179
10i4

Prepared by:

[1]A special modification to this vehicle during May.

Figure A–2. Answer for objective 228, exercise 2.

229 – 1. You answer should contain seven of these items: Title, stubs and captions, footnotes, source, "prepared by" section, item arrangement, and legend.

229 – 2. When more than one quantity is presented.

230 – 1.

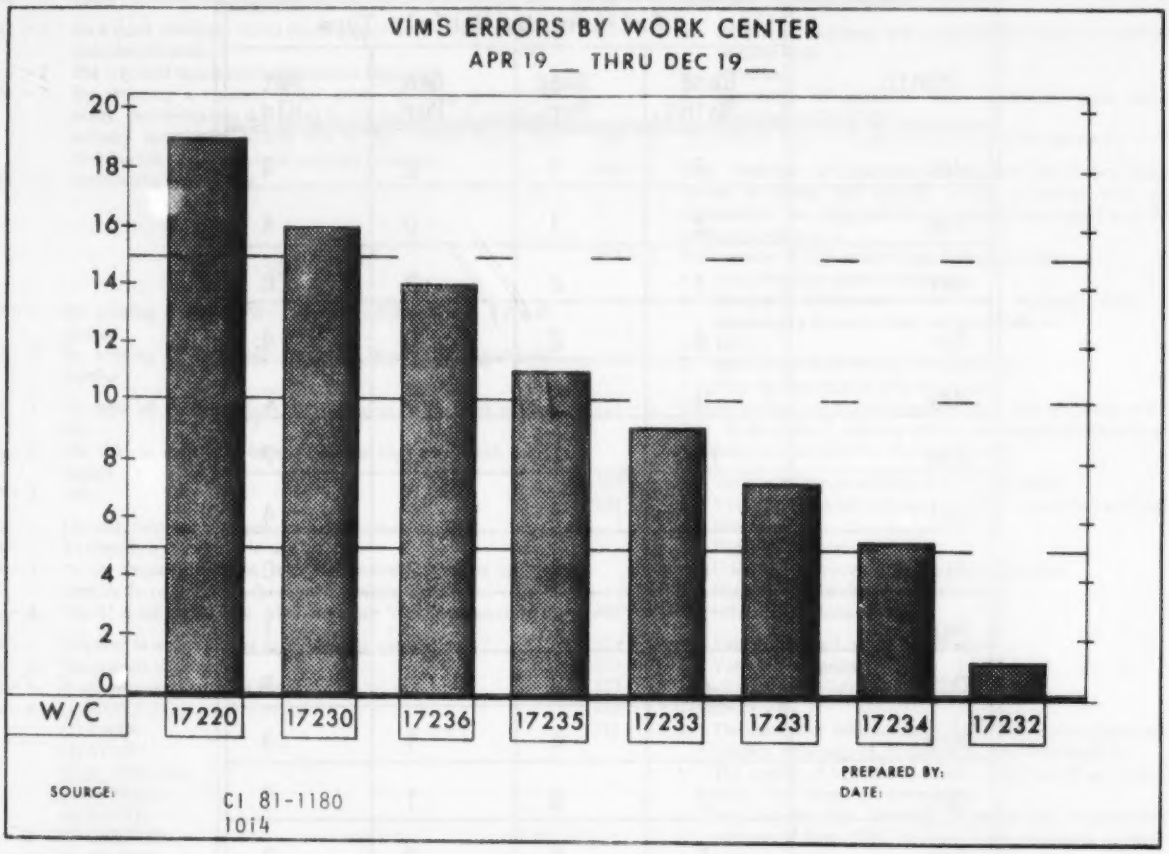

Figure A–3. Answer for objective 230, exercise 1.

230 – 2. The eyes cannot properly compare sizes by area and volume.

231 – 1.

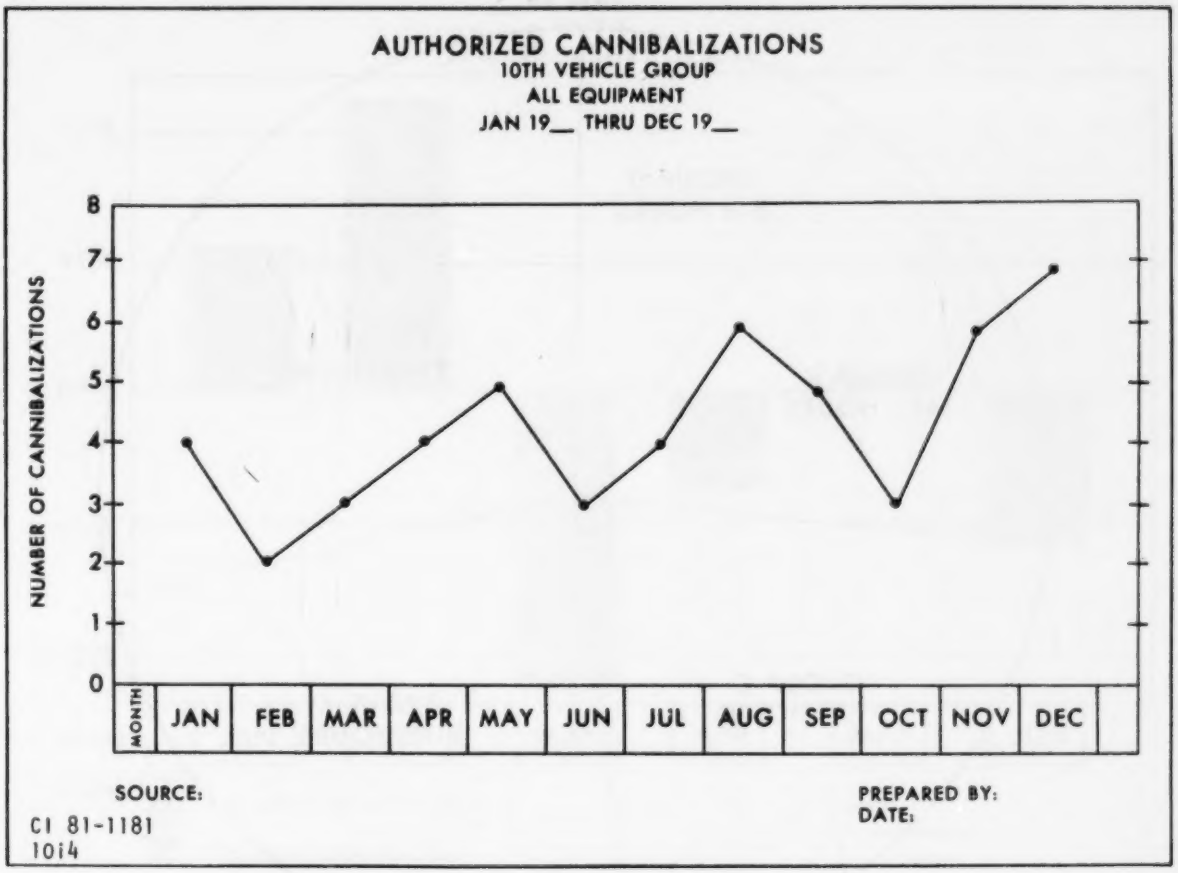

Figure A–4. Answer for objective 231, exercise 1.

231 – 2. When changes are known to be abrupt.

232 – 1. The line chart and bar chart.

232 – 2. That the erratic item should be placed at the top of the surface chart.

233 – 1.

Figure A–5. Answer for objective 233, exercise 1.

233 – 2. Two- and three-dimensional comparisons should not be made with this type of chart, because these types of comparisons are too difficult for the eye to comprehend.

234 – 1.

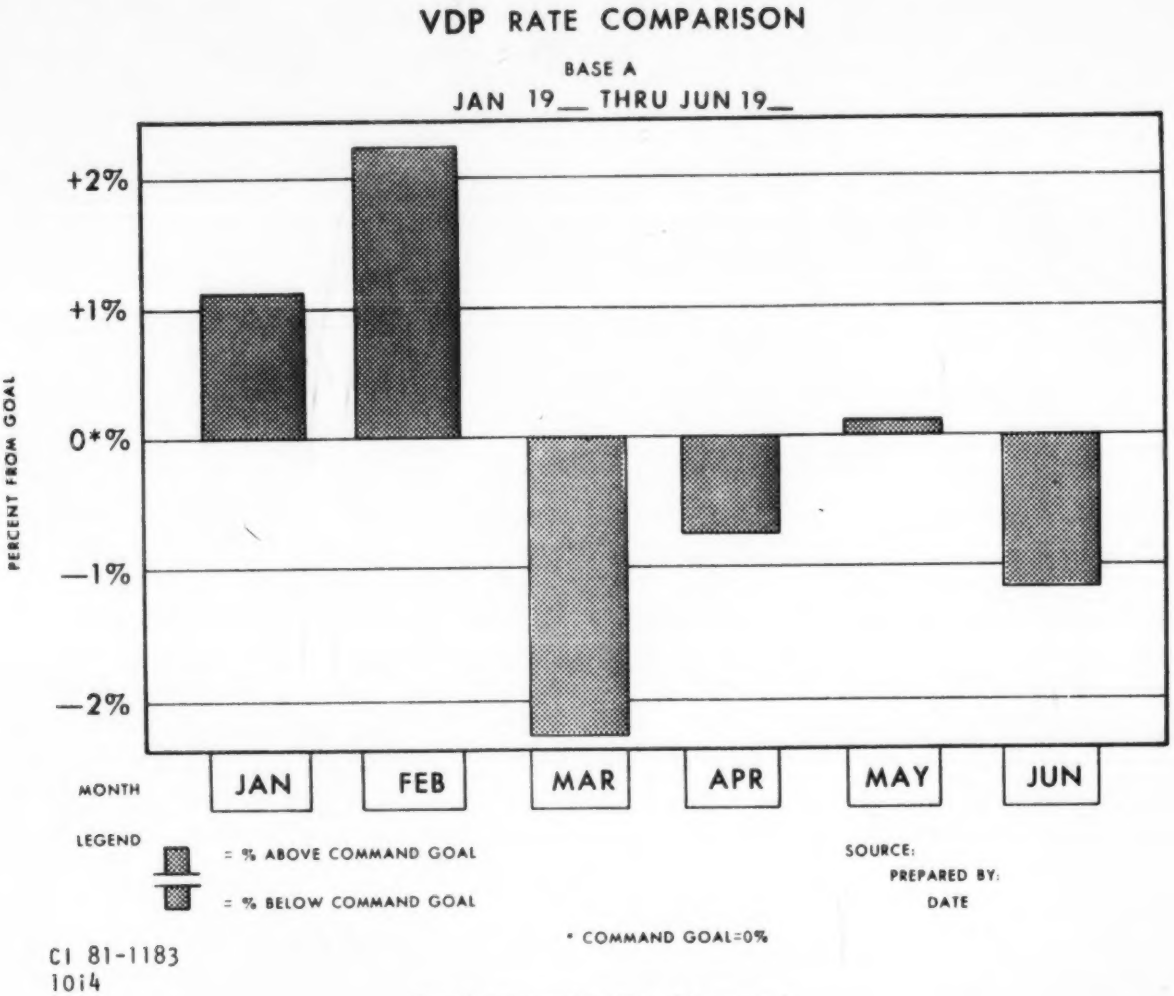

Figure A–6. Answer for objective 234, exercise 1.

234 – 2. (a) For dates displaced and (b) when the time period involved is relatively short.

CHAPTER 6

235 – 1. By use of a strong, central theme established early in your writing and adhered to throughout.

235 – 2. That separate parts read in a natural, easy flow from one idea to another.

235 – 3. By introducing a major idea with the phrase "This is important," or by some mechanical means, such as underlining your main ideas, placing them in italics, or using headings and subheadings.

236 – 1. If the subject is a serious one, the general tone of the writing should match.

236 – 2. Your writing mirrors you. If it reflects your sincere feeling about your subject, your message will ring true, and the reader will give your ideas an honest consideration.

237 – 1. Use single, uncomplicated sentences and write as you talk.

237 – 2. Direct writing is read easily and comprehended quickly.

238 – 1. Your use of the language is the standard by which the reader forms opinions of you and ascertains whether your ideas are worth considering.

238 – 2. a. Replace "were" with "was."
b. Replace "we" with "us."
c. Replace "Its" with "It's;" replace "afto" with "AFTO."

239 – 1. In the Body.

239 – 2. In the attachments.

239 – 3. In the heading and ending of the report.

239 – 4. In the discussion section.

239 – 5. In the conclusion section.

239 – 6. In the attachment.

240 – 1. Accuracy, brevity, clarity, and transitions.

240 – 2. Brevity.

240 – 3. To allow the reader to progress easily from one idea to the next.

240 – 4. The attachments. Under accuracy.

240 – 5. Clarity; all of it.

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